Multimedia Lab Projects

From Professional Publications to Casual Multimedia

Production and Business Development
1987 - 1990

GTV: Geography Television
Worldview
Mathmagic Lab
Constitution
Voices of the Thirties/Grapevine
Interactive NOVA
Multimedia Production System
Visual Almanac
Life Story
Preschool
Disappearing Ducks
Moss Landing
Multimedia Presentation Resource
Restructuring
Globe Project
Future Worlds

Multimedia Research
1990 - 1992

Video Memos
Aspen KIDS
Desktop Drama
Small Device Feasibilty Study
The Clipster
Project Production
Connections
Beads
Advent Calendar
101 Activities
Beyond the Desktop
Classroom Multimedia Kiosk
Ross Bulletin Board
Ross Report
Collaboration Scenario
Kids, Cameras & Computers

The Apple Multimedia Lab
(1987-1990)

Production and Business Development

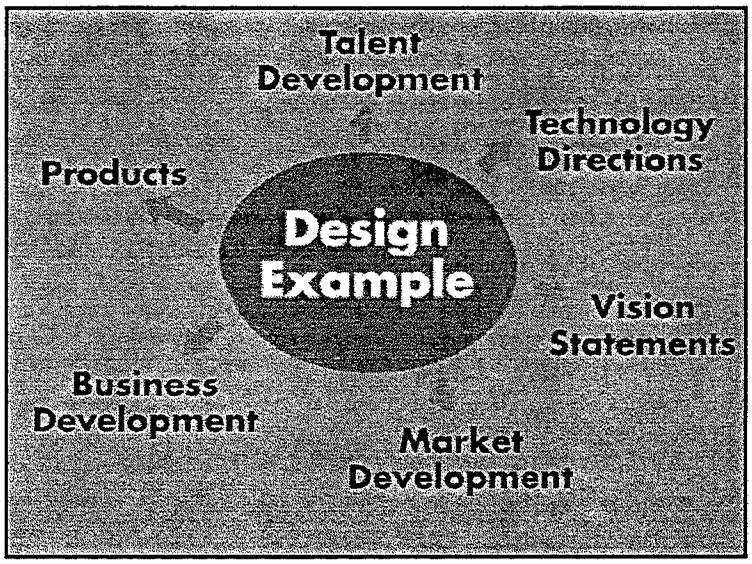
The Multimedia Lab was established in 1987. Its charter was to explore opportunities for multimedia computing, and to demonstrate the findings within Apple Computer, Inc. and to potential Macintosh developers in this arena.

The enabling factor for this work was HyperCard, introduced in August 1987. It allowed the quick development of a series of "design examples" that illustrated multimedia in action. This allowed the Lab to focus on concrete instances and to garner direct experience in multimedia design, complementing other, more analytic, approaches to this emerging medium.

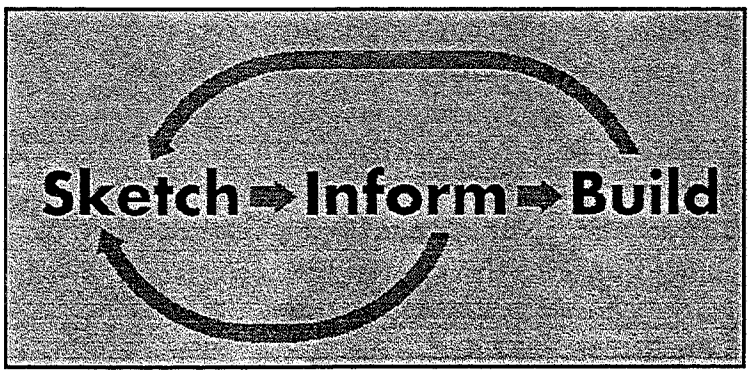
Most of these initial design examples were collaborative ventures. We acknowledged early on that partnership was necessary in this field, and that other businesses and individuals—ranging from publishing, education and television to video production—would augment the Lab's talent and technological orientation.

Our basic methodology during this period was to sketch ideas, then use these sketches to inform a range of constituencies. Some prototypes were then built to scale, both as a production research exercise and to produce products. We called our approach to this development "design driven." The simple idea was to create a set of experiences with new media, then use these to drive business, marketing and technology decisions.

The audience for these design efforts was diverse. One primary faction was engineers within Apple Computer, Inc. and other technology companies. We showed them our design examples to encourage the development of new software and hardware technologies—interface designs, remote



The design example was the initial focus of our activity. Each was typically a three-month, $50K project.



Early work involved very different activities and approaches. Sketches were brief and exploratory. Inform phases required huge "demo efforts." In Build phases, we acted as a production team.

controls, video boards, optical media peripherals, etc.—that would support a broad spectrum of multimedia scenarios.

Another principle audience was our computer customers. Here we used our design examples for market development, showing not only what could be constructed using existing tools, but what might emerge from future technologies.

Finally, we also showed our examples to potential business partners—content owners, curriculum designers, publishers and others—to spur their own efforts in the field of multimedia.

Though our design examples were small, they were all designed as prototypes of potential products. In most cases, our design partner was interested in bringing them to market as multimedia products or tools. Four products resulting from these early prototypes are: *GTV: A Geographical Perspective on American History*, produced by Lucasfilm, Ltd. for the National Geographic Society, in collaboration with the state of California; *The Visual Almanac*, published by Optical Data, Inc.; *Interactive NOVA: Animal Pathfinders*, produced by WGBH-NOVA and Peace River Films, published by Scholastic; and *Media Maker*, published by Macromind in association with the Multimedia Corporation. Three other products are currently under final development; these include *Life Story*, to be published by Wings for Learning, *Grapevine*, and *Disappearing Ducks*.

Our emphasis in these early projects was on education, though we did a number of examples for other markets, including business and public space. There were two reasons for this. For one, multimedia technologies proved to be very successful in supporting learning environments, and students are wonderful prototypes of our burgeoning information-intensive society. For another, we viewed education as one of the early mass markets for this new class of products. We felt that other markets, including business and higher education, would initially be custom-production oriented, requiring tools but not our specific multimedia titles.

A significant by-product of our design examples was the development of talent and applied research in this new media. More than 100 people worked in the Lab during these years, gaining multimedia design skills along with our core staff. Many of these people now work in the general multimedia production industry, including a number who have established their own businesses.

The acceleration of interest in our projects, and in the field of multimedia development, was significant between 1987 and 1990. The research accomplished in those years has shaped multimedia product design and production techniques, and been the impetus for recent research projects carried out in the Lab. This experience has helped promote our current goal: how to structure and implement the casual use of multimedia in everyday activities.

In this research we now address the acquisition of original video materials and the development of standard software elements. We are also actively bringing new media into a networked environment and developing new interface conventions for new media use.

Materials Available:

Ambron, S.A. and Hooper, K. (Eds), Interactive Multimedia, Microsoft Press, 1988.

Ambron, S.A. and Hooper, K. (Eds), Learning with Interactive Multimedia, Microsoft Press, 1990.

Woolsey, K. H., *Multimedia Scouting*, IEEE Computer Graphics and Applications, July 1991, pp. 26-38.

Technical Reports (available through Apple in Print): *Visual Almanac Technical Report, Producing Interactive NOVA, Real-space Imaging, AppleCart.*

GTV: Geography Television

This project started in 1986 as a collaboration between Apple Computer Inc., Lucasfilm Ltd., and the National Geographic Society. The task was to combine imagery and computers to create a geography program "hip" enough to engage the imaginations of middle school students. The focus was on the formulation of a structure for telling stories. Our basic intuition was that if we developed a method of using visual and acoustic materials in a concise and easily manipulable manner, it would enable crisp group presentations of ideas, as well as the production of new materials by users through recombining available imagery.

The initial prototype for the product was produced for an Apple IIe computer, in anticipation of later delivery on the Apple IIGS. The prototype focused on a set of short segments (1-2 minutes) that described important geographic ideas. Still images provided the basic element of these segments, and music drove the pacing . The segments were designed for teacher presentations, and included additional tools that allowed their reordering into different sequences.

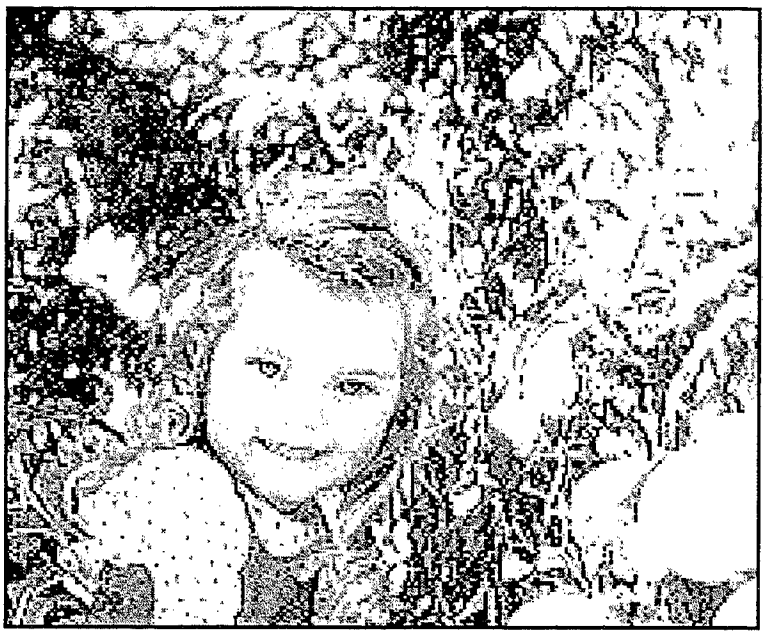
This prototype was developed into a 1990 product for Apple IIGS and videodisc by Lucasfilm Ltd. and the National Geographic Society. The Apple Multimedia Lab then collaborated on a Macintosh and HyperCard version of GTV in 1991.

Issues:

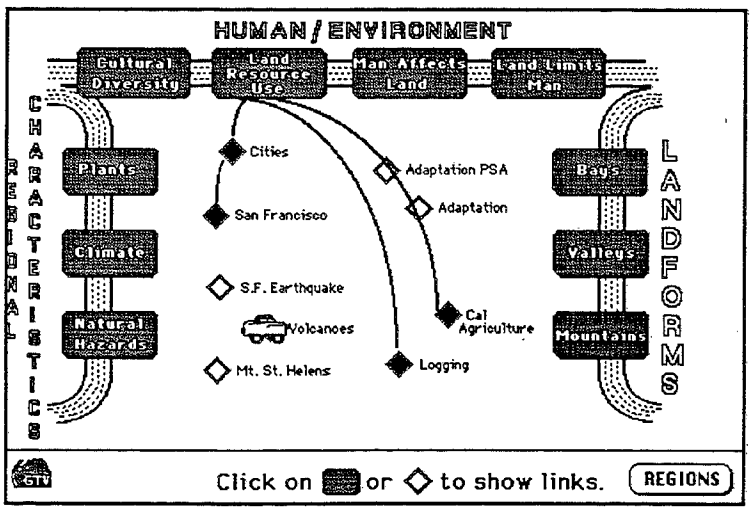
Can a teacher-centric product be used effectively in classroom presentations as well as small group interactions?

What tools are required to manipulate still images so they can be used in a sound-driven environment?

How might one design tools to allow students and



One goal of this product was to provide a geographic perspective combining human and environmental factors.



One early approach, taken in an internal prototype, provided users with a basic "freeway" of concepts, encouraging their selection of available materials.

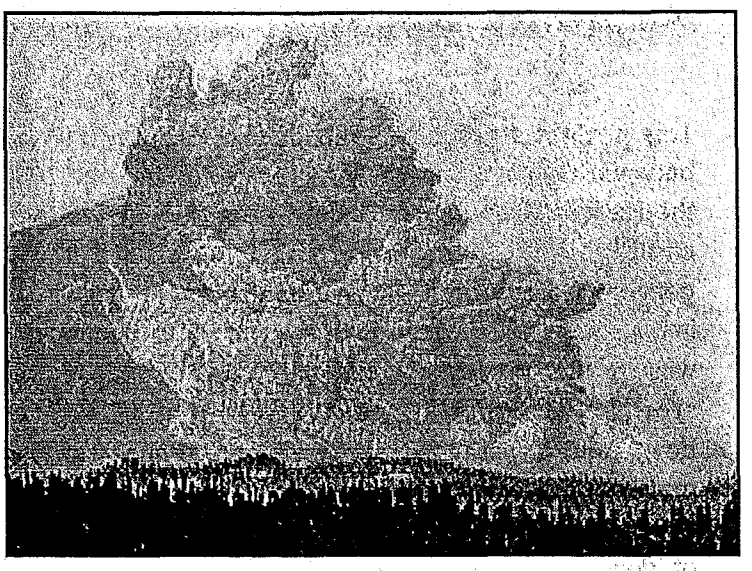
teachers to combine available images in their own original compositions?

Observations:
These sound-driven slide shows have been successful in classrooms. Short sequences give teachers great "conversation starters" that can be integrated with other classroom materials. And they have none of the stodgy feeling many of us associate with the hum of a slide projector. Both teachers and students have embraced the opportunity to create their own materials.

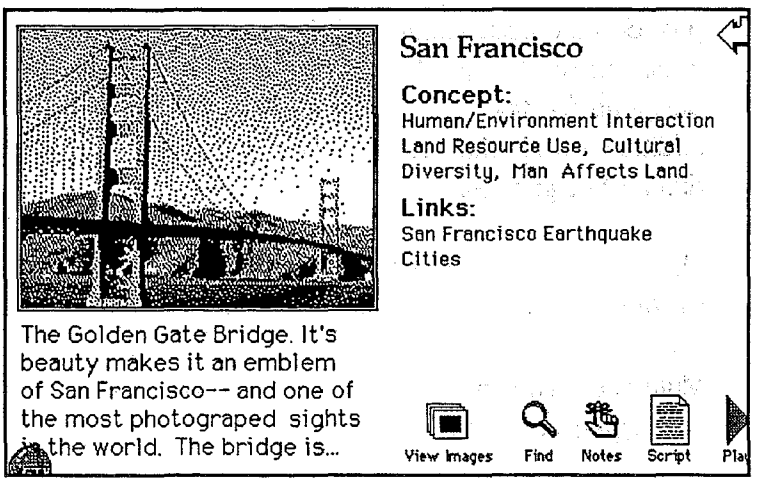
Equipment Used:
Apple IIGS or Macintosh
Videodisc Player

Prototype Designers:
David Lawrence, Doug Crockford, Matthew Kerns, Kristina Hooper Woolsey.

Materials Available:
Videotape: GTV (1987)
Product: *GTV*, Optical Data Corp.,Warren, NJ: 800-524-2481



A set of still images of the eruption of Mt. St. Helens in the prototype was a convincing demonstration of the emotional power of sound-driven imagery.



The initial prototype investigated geographic concepts in the context of northwestern and western sections of the U.S.A.

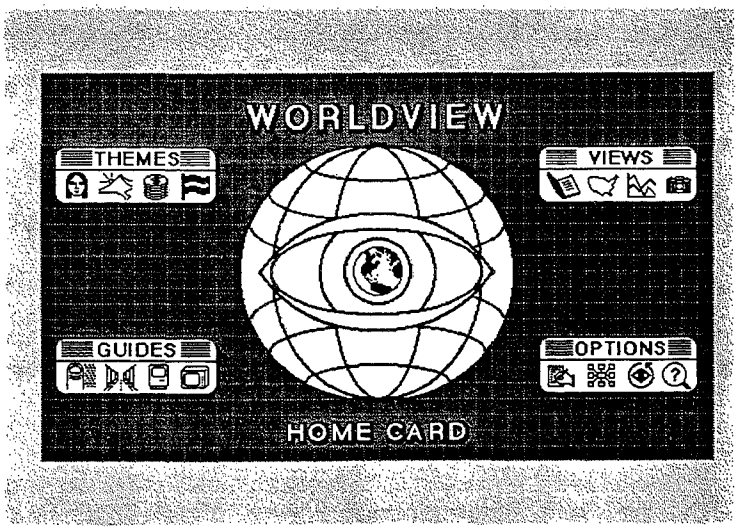
Worldview

As HyperCard was being developed, Fabrice Florin was working on *Worldview* and providing feedback to the Hypercard team This electronic atlas prototype demonstrated the ways HyperCard could be used to access visual material. It also showed how image archives could be used for purposes for which they were not necessarily designed.

At the heart of *Worldview* is a map browser that lets users access views of the world with a single mouse click on a map. Navigation panels on the Macintosh screen make it easy to steer through this geographic database of the world. Users can look up items by themes, such as people, land or economy. Or they can select alternate views of data, such as facts, graphs or pictures.

Stock footage images were compiled on a write-once videodisc, along with live action video sequences. The user could click on the map and see a picture of the environment represented, bringing the "territories" on the map alive. By clicking on a particular symbol on a map, the viewer was treated to a picture of a corresponding landmark — the Eiffel Tower, the Golden Gate Bridge, etc., Other treatments included flybys over an area. Reference aspects of an atlas were also available to the viewer. The pictorial atlas combined an on-line database with traditional text references, encyclopedic articles, photo captions, graphs, sounds, indexes and related materials. Users could choose the most appropriate information source and medium, and then "cut and paste" those materials into their own reports. The viewer could look up the population of Paris while viewing the French countryside, or explore the food industries of Africa while looking at a desert landscape. The pictures provided a context for the interpretation of data, and the computer gave the viewer quick access to the particular topic.

Multicultural images are easily accessible with the Worldview prototype.



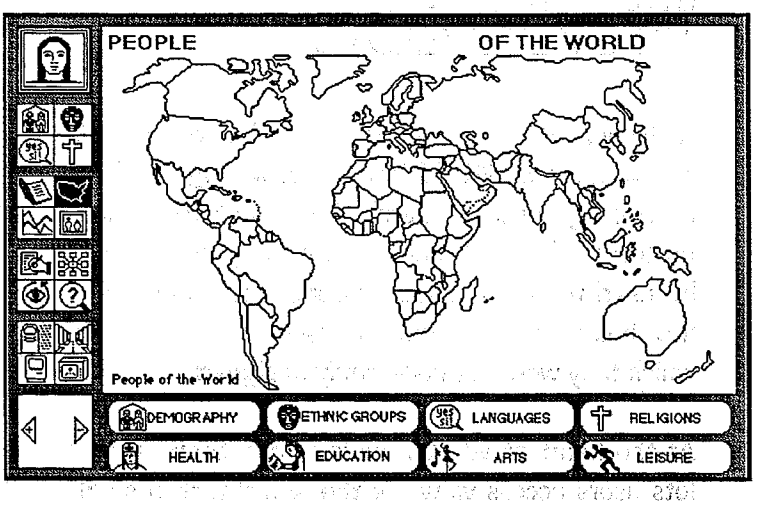
A range of different choices for browsing is available from a single home card.

Worldview demonstrated the potential of the HyperCard and videodisc combination as a multimedia platform. By bringing images together with multiple sources of data and demonstrating interface options it has provided an excellent vehicle to show people the potential of HyperCard and multimedia. It has also became a classic example for future reference.

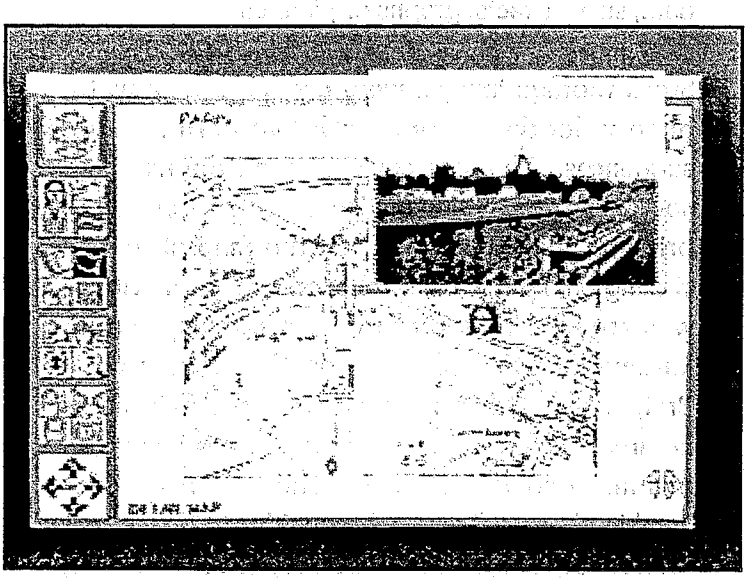
Equipment Used:
Mac Plus with HD 20
Pioneer 4200 videodisc player
HyperCard

Designer:
Fabrice Florin

Materials Available:
Videotape: *Worldview*, 1988
Apple Multimedia Group Technical Report #17
Florin, Fabrice, "Information Landscapes" in Ambron, S.A. and Hooper, K.S. (eds) *Learning With Interactive Multimedia*, Microsoft Press, 1990.



Viewers can choose a number of differnet themes to examine in a geographic perspective.



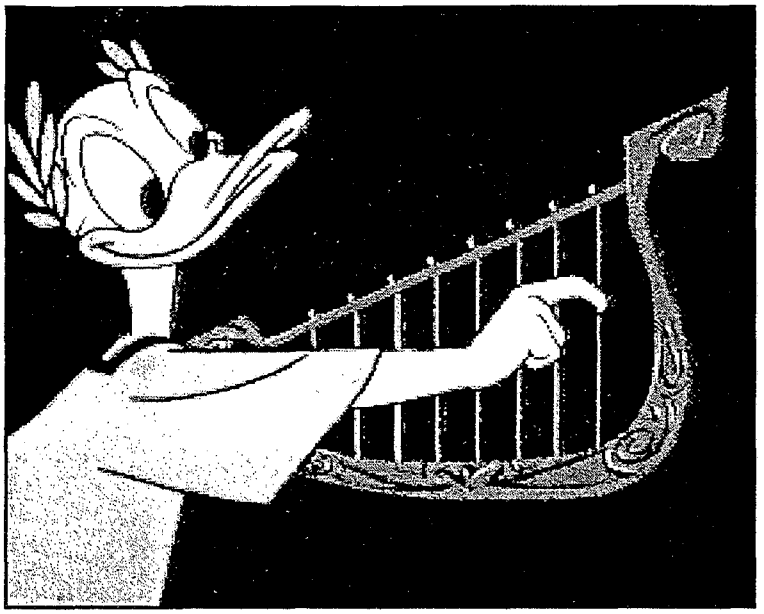
A one-screen prototype was developed, using a video overlay card, after the first tow-screen version. It displays video images directly on the map, rather than as a separate screen.

Mathmagic Lab

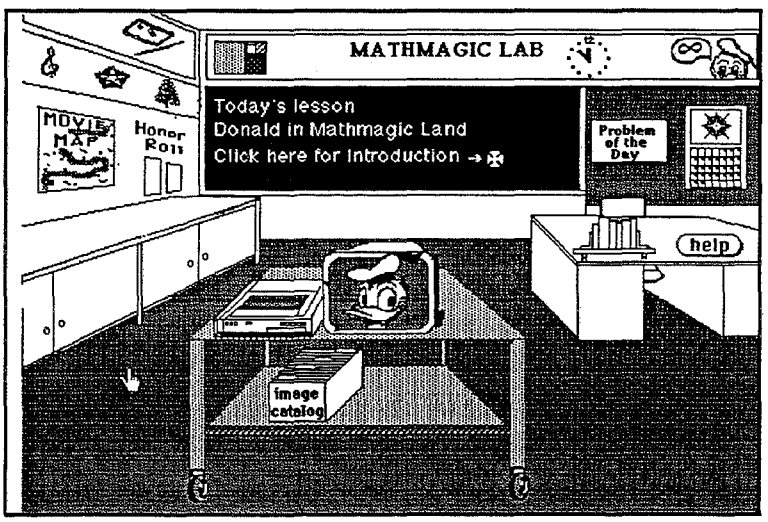
The Mathmagic Lab was one an early HyperCard and videodisc prototype. Its goal was to demonstrate the educational value of repurposing a Disney film, "Donald in Mathmagic Land." The 28-minute film was transferred to a videodisc and used as the basis for an interactive environment. The interface was based on a classroom metaphor; using the on-line classroom, users can access a number of objects, each offering a different entry into the movie. For instance, an "image catalog" accessed datacards for each segment of the film. A movie map on the wall showed a linear representation of the movie for easy random access to scenes

Other objects around the room offered tools to help the teacher incorporate their material into the curriculum. A calendar could be clicked to see the schedule and lesson plans related to topics in the movie. A bookshelf on the teacher's desk offered books to tie scenes to the California math framework, as well as to a textbook, dictionary and atlas.

Walls and bulletin boards contain other special items tying interesting sections of the movie to special activities. "Problems of the Day" offers puzzlers based on images in the movie. A picture of a billiard table on the wall uses the scenes of Donald Duck playing billiards, and links them to a piece of software in which the user can play billiards and experiment with angles of reflection the way Donald did. A clef symbol on the wall accesses an activity on mathematics and music. In the movie there is an explanation of how the musical scale relates to mathematics. Donald plays each note of the scale. The user can click on any harp string shown on the screen, causing Donald to play that note on the video. Users can make Donald play a simple song, even if Donald never played that song



Donald Duck provides a fanciful exploration of mathematical ideas the film"Donald in Mathmagic Land". The computer program gives students some of the interactive ability available to



A classroom metaphor provides students and teachers sensible access to the materials.

in the movie.

Finally on the teachers desk is a "help" sign. By clicking here, the user brings up a screen where every active item in the classroom is circled, and clicking on it brings up a description of what that item does.

Through this HyperCard environment, the movie becomes a multiple resource of images to support the learning and teaching of mathematics.

Issues:
How can the material in a linear movie be accessed?

How can a linear movie be segmented into meaningful units?

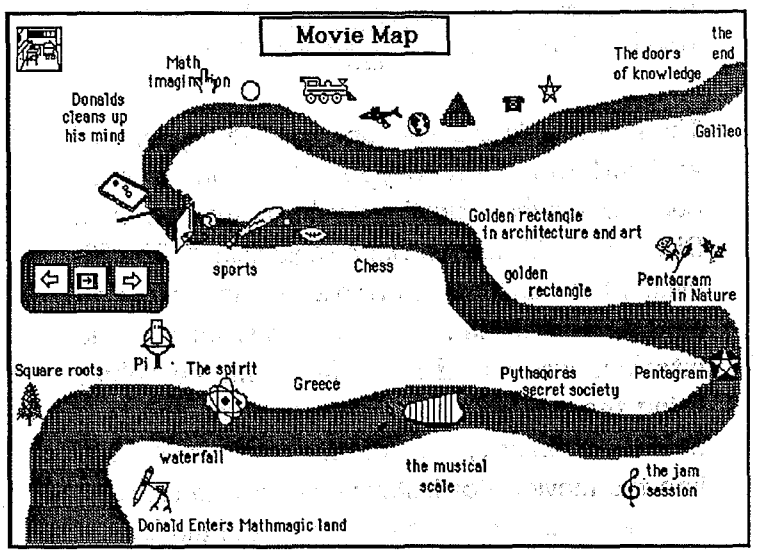
Can a classroom metaphor be a tool for teachers to link content from a movie to other on-line and off-line materials such as games, books, calendars, and lesson plans?

What are unique ways to interact with images that were designed without interaction in mind?

What does a simple "help" system for a spatial metaphor look like?

Observations:
Educational movies often have depth that passes by the viewer because there isn't time for full explanations. An interactive environment can turn a movie into a resource of ideas to be explored. This adds tremendous value to the original material.

The "movie map" developed in this prototype has become classic representation to provide random access to linear material.



This movie map provide students and teacher with direct random access to sections in the linear movie.

The simplicity of the classroom metaphor makes this project a good introductory example to explain to novices the value of this interactive technology.

Equipment Used:
Mac Plus, 20 meg hard drive
Hitachi 900 videodisc player & video monitor

Collaborators:
Walt Disney Software, Apple Computer, Mills College

Designer:
Margo Nanny

Materials Available:
Videotape: Mathmagic Lab, 1987

Constitution

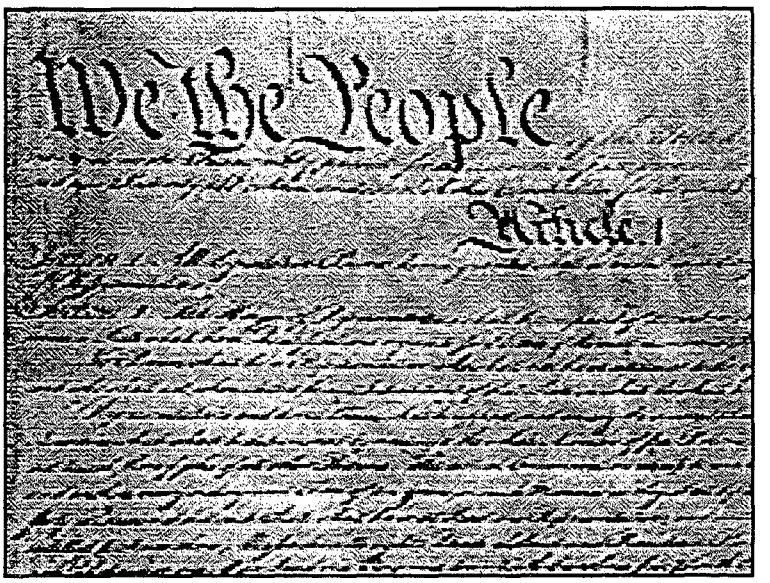
Textbook treatments of the United States Constitution are often the dullest chapters in the history book. The challenge of bringing this document to life in the classroom was undertaken as an early collaborative design effort between Apple Computer, Inc., Optical Data Corporation and Scholastic, Inc. The goal was to create a prototype multimedia system to help teach concepts of the United States Constitution in a historical context. The result was a HyperCard and videodisc prototype called "The Constitution Learning System: An Electronic Museum."

The system consisted of a multimedia database presented to the user as a museum with three wings: an Exhibit Hall for presentation, Galleries for browsing and research, and the Library for authoring.

The Exhibit Hall provided a place where users could browse through collections of thematic material organized for presentation. It offered guided tours and lesson plans, as well as new presentation techniques such as animated maps, pictorial menus and video storyboards.

The Galleries enabled users to do their own research and retrieve information more directly. The material was organized in two dimensions, subject and time. The gallery was depicted as an extended wing of the museum, with five long corridors, one for each subject category: Events, Places, People, Ideas, and the Constitution. Within each corridor, the material was arranged chronologically. A data cube, which showed materials by theme and date in a rather abstract way, provided a final representation of the material for easy access.

The Library offered tools and raw materials with



Text documents –like the U.S. Constitution– can be contextualized with a multimedia surround.

The exhibit hall provided students with a range of compelling entries to the materials.

which to make new database cards and exhibit trails. The Trail Maker tool allowed users to sequence cards, creating their own "trail" and then install it into an exhibit room for viewing by others.

Issues:
How might one add sounds and visuals to a text document?

What are the principles of building new materials from existing video footage?

What tools are appropriate for a historical presentation– e.g., time lines?

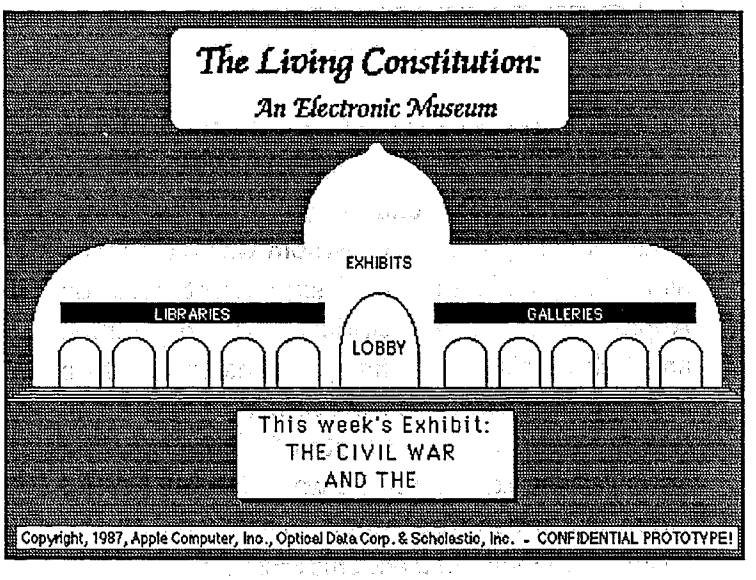
How might collaborations work between experts in technology, production and content areas to build multimedia systems?

Observations:
Well-designed video clips can tell compelling stories and cause viewers to want to know more. This point of motivation creates an opportunity for a teacher to introduce related materials in a context that has meaning and value to the learner.

Sound provides a live presence almost as impactful as motion video. The use of still images combined with compelling audio demonstrated how precious videodisc real estate can be extended without losing the dynamic of live presentation.

Time, as a dimension of information, is highly malleable. Compressing hundreds of years to fit on a small screen doesn't necessarily lose information, but gives new information about the shape of history.

Different media appeal to different people. From a purely opportunistic viewpoint, multimedia holds the possibility of providing more "hooks" for capturing the attention of the entire class.



This front card established the museum metaphor, and encouraged users to enter into the available materials.

Equipment Used:
Mac Plus with HD 20
Pioneer 4200 videodisc player
HyperCard

Multimedia Lab Designers:
Steve Gano, Fabrice Florin, Sueann Ambron, Kristina Hooper Woolsey
Collaborators: Apple Computer, Inc.; Optical Data Corporation; Scholastic, Inc.

Materials Available:
Videotape: Constitution Learning System, 1988
Florin, F., "Information Landscapes" in Ambron, S.A. and Hooper, K. eds., *Learning with Interactive Multimedia*, Microsoft Press, 1988.

Voices of the Thirties

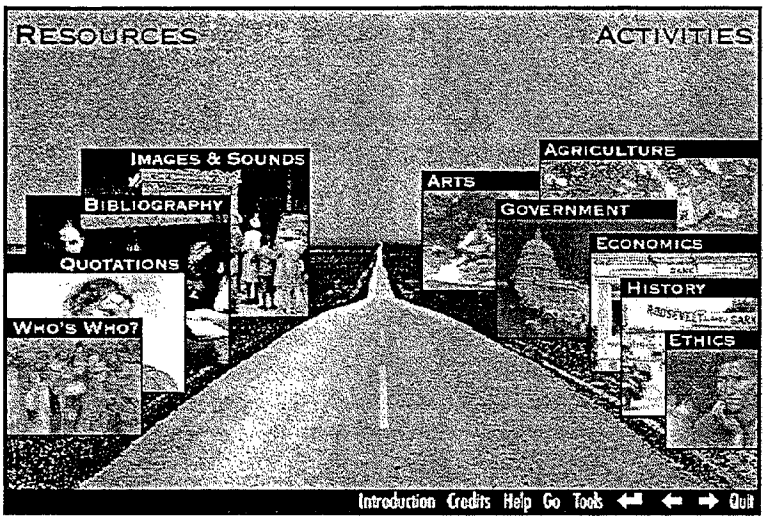
This project began when a high school librarian, Bob Campbell, and a high school English teacher, Patricia Hanlon, wanted to find and store information to help their students understand the 1930s, as depicted in John Steinbeck's epic Great Depression novel, *The Grapes of Wrath*. This project sought to solve problems involving information storage, linking and management—including text, graphics, imagery, music, and sounds.

The original prototype for this product, *Grapevine*, was built on the concept of "a library in a box". It included a selected body of teaching material, and provides easy access to that material in a large data base, linked by topics. Teachers can modify, add, edit and rearrange text, still and moving pictures, and sound. *Grapevine* includes teacher guidance in the form of extensive annotations, comments, suggested activities and questions. The researcher accesses information on command through topic fields such as Quotations, Who's Who, and Bibliography. These have additional sub-links to other sources, imagery, and sound. Both teachers and students can integrate this information into multimedia documents, thus continuing and expanding on the original product by adding their own contributions.

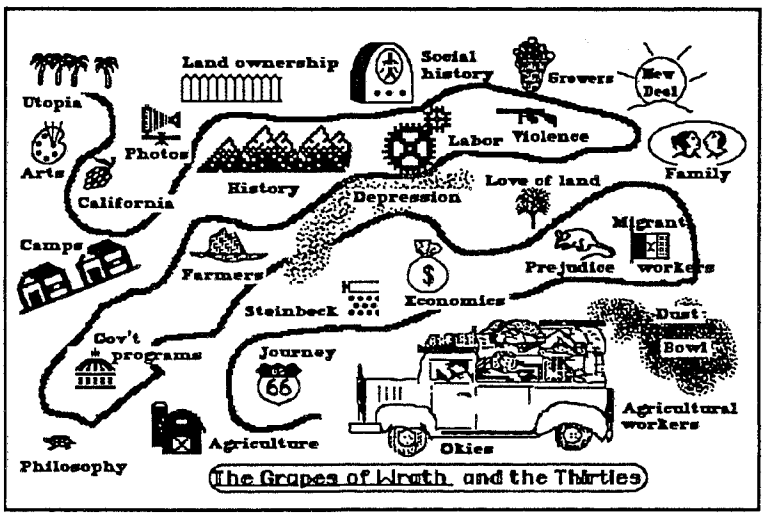
The product that developed from *Grapevine* is called *Voices of the Thirties*. It containes a simple integrating structure and an interface that extends the useability of *Grapevine* from one teacher to a wide number of teachers and schools.

Issues:

HyperCard provided the tool needed for this situation. It includes the characteristics of a database, a research instrument, a word processor and editor, a painting program, and an audiovisual appliance.



The roadway provides the basic metaphor for the prgram. On the opening card of the product students and teachers can select from a range of available Activities and Resources

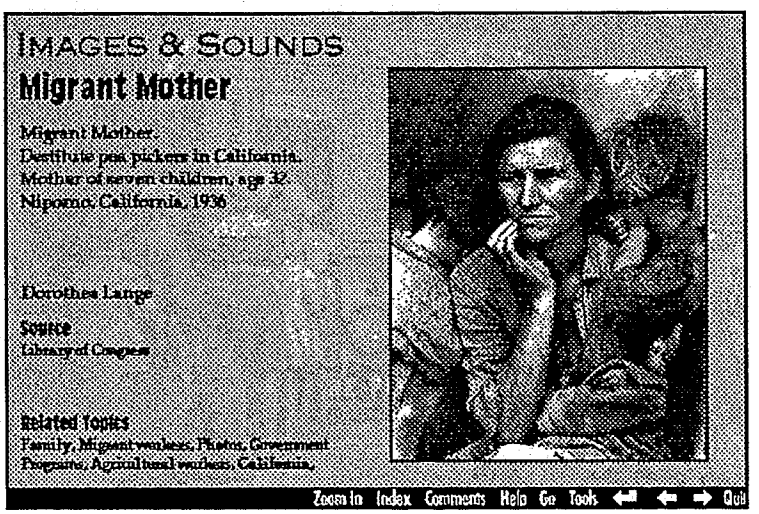


The comparable opening screen from the first version of Grapevine.

The first breakthrough for the project was to identify limited but critical key words to help guide the user through sound, graphics, and moving images.

Building an easy and seamless route through the large and varied body of information in Grapevine was one of the greatest challenges. The challenge in Voices was to extend the idiosyncratic project created by one teacher, and to create out of it a general resource available to many.

Teachers must be able to develop, manipulate, and extend the materials they use in the classroom. They and their students can build on their work from year to year, so it evolves, providing a rich texture for the classroom.



A large number of images are available in the product, including a set from Dorthea Lange, a prominent photographer of the period.

Observations:
Not all teachers have the time, the inclination, the skills, or the resources to develop complex programs on their own. Yet in the classroom, material of this depth and flexibilty is exactly what the teacher and student need.

Equipment Used:
Mac Plus computer & HD 20
Panasonic write-once videodisc player
Pioneer LaserDisc 4200
MacVision video digitizer; MacRecorder sound digitizer; Apple Scanner
HyperCard

Authors:
Patricia Hanlon and Bob Campbell

Product Designers:
Abbe Don and Nathan Shedroff

Materials Available:
Product: *Voices*, 1992, WINGS for Learning, Scotts Valley, CA. 800-321-7511-

Videotape: Grapevine, 1988

Apple Multimedia Group Technical Report #17, 1988
Campbell, Robert and Patricia Hanlon, "Grapevine: a High-Tech Voyage Through the 'Thirties," American Educator, Winter 1988.

Campbell, Robert and Patricia Hanlon, "HyperCard: A New Deal in the Classroom," in Ambron, S.A. and Hooper, K.S. *Learning With Interactive Multimedia*, Microsoft Press, 1990

Campbell, Robert, "(I Learned It) through the Grapevine: Hypermedia at Work in the Classroom," *American Libraries*, March, 1989.

Solomon, Gwen, "Heard It, Read It, Saw It on the Grapevine", *Electronic Learning*, May, 1989.

Maloney, Janice, "Rewriting History", *Publish*, September 1992.

Interactive NOVA: Animal Pathfinders

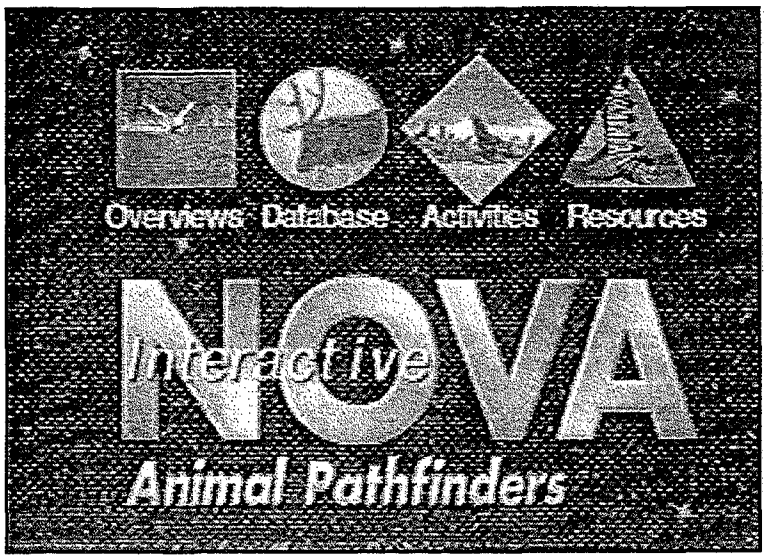
In 1986 WGBH and Peace River Films gathered a team of researchers, writers, and educators to consider coproducing linear and nonlinear versions of a NOVA film, *The Mystery of Animal Pathfinders.* In 1987, they joined with the Apple Multimedia Lab and used the newly-developed HyperCard to produce a prototype. The final commercial product debuted in 1990.

The film, *The Mystery of Animal Pathfinders,* dealt with migration and concepts pertinent the high school biology curriculum. The multimedia product's intent is that students view the film first - it is included in the product -then use the interactive system to broaden their investigations about additional species, different environments and other animal behaviors. The system includes extensive documentation as well as simple tools that allow students and teachers to edit video and text elements for their own presentations.

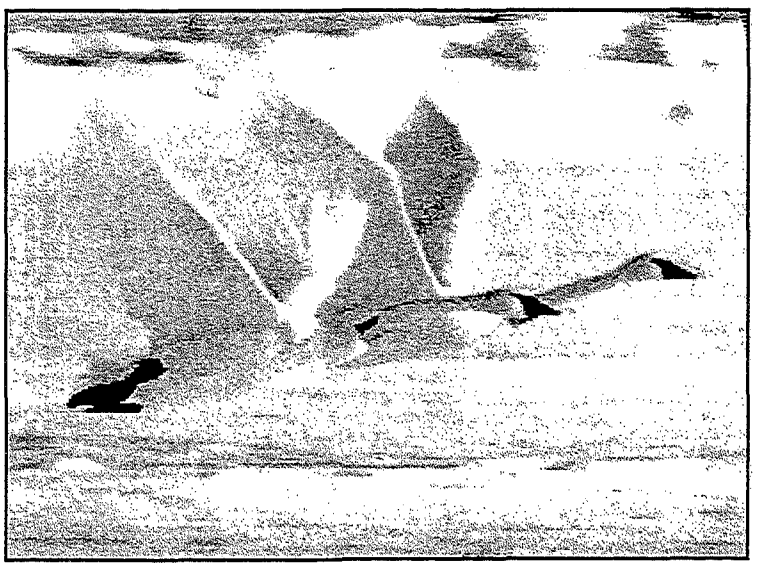
The product also contains some video-centered activities. One is called "bee dances." Students watch a dance, translate the bee's message, and decide where the honey is located, and then fly off on a surrogate travel, zooming through fields to the honey, using a "bee;s eye" point of view. A second activity lets students emulate actual investigations of monarch butterflies. And a final activity teaches students about the potential extinction of turtles by presenting them with a unique detective adventure. Here the "spirit of the chase" gives context to short video segments describing the perils turtles face today.

The major goal of the system is to allow students to "do science", rather than passively learning from the work of others.

Issues:
How can existing films be modified for interactive use?



The program has four sections: overviews, a multimedia database, their activities, and a set of tools and general considerationsl



Beautiful nature photography, well known in NOVA shows, provides a core element of the program.

What other kinds of materials should be added to a single film to allow it to directly meet curricular requirements, and engage students in meaningful questions and activities for more than the one hour the film runs?

What kinds of maps can help users navigate through a large system of images, information and activities.

Can one develop activities which incorporate video materials effectively?

Will students and teachers develop their own presentations with these materials.

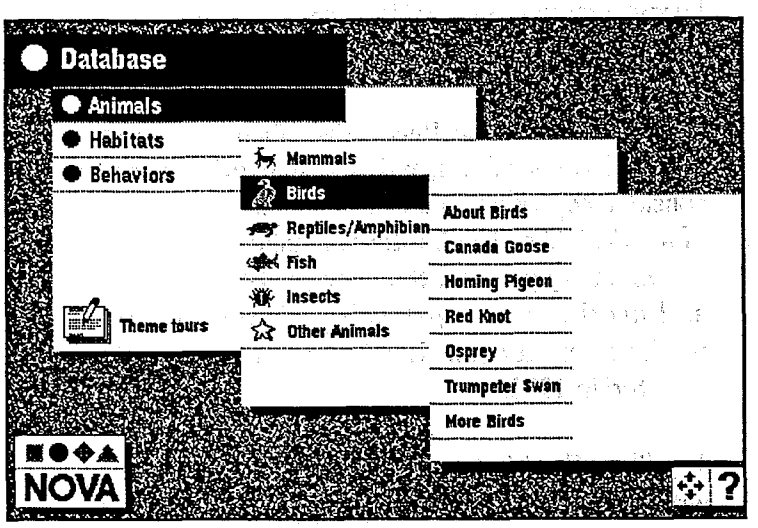
Will Interactive NOVA's Animal Pathfinders become a model for such organizations as a public broadcast station (WGBH) and an award winning TV production company (Peace River Films) to join in collaborations and enter the multimedia industry?

Observations:
The information structure designed for interactive viewing is in this example quite unrelated to the movie. Rather than charting the course of the movie the main access method for this project focusses on the different types of materials; filmic, database resources, and activities.

This model of production has been generative. WGBH has recently completed two other Interactive NOVA programs: *The Miracle of Life*, and *The Race to Save the Planet*, both published by Scholastic Publishing.

Equipment Used:
Mac Plus & HD 20
Pioneer 4200 Videodisc Player
HyperCard

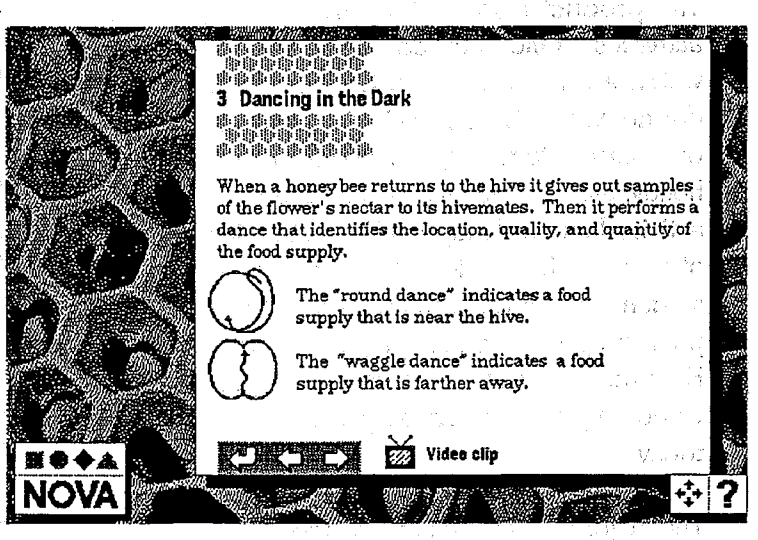
Awards:
Collaborators: Apple Computer, Inc., WGBH, Peace River Films.
Designers: Bill Purdy, Ted Sicker, Barry Cronin,



A simple set of cascading menus provides viewers with access to a range of source materials.

John Borden, Kristina Hooper Woolsey

Materials Available:
Interactive NOVA : *Animal Pathfinders*, New Technology in Education Series, Scholastic Software, 1990. 800-541-5513.
Technical Report: *Producing Interactive NOVA*, Apple Multimedia Lab, 1991. Available through Apple In Print.



In this activity on bee dances, students get basic instruction on the dances, with video illustrations, before they try to interpret these dances themselves.

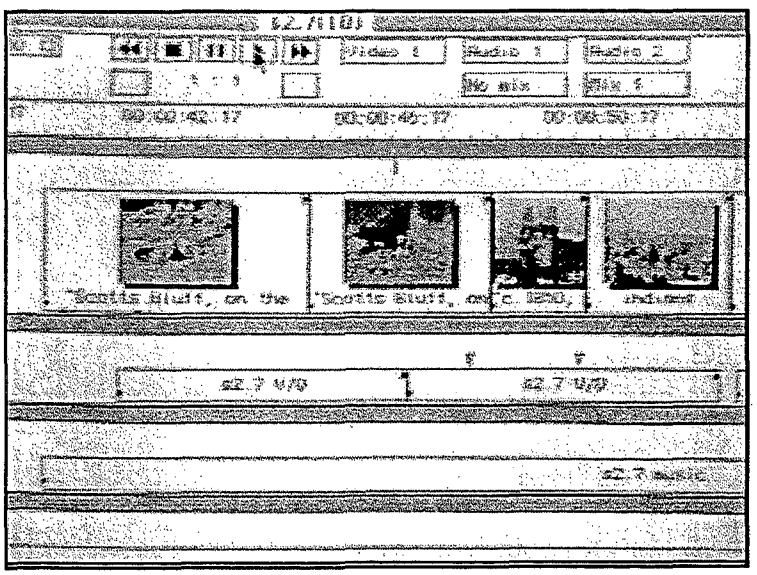
Multimedia Production System

The Multimedia Production System (MPS) is a computer-based editing system that produces materials for use in interactive multimedia delivery systems. It was developed in 1987 by the Apple Multimedia Lab and Lucasfilm, Ltd. as a production environment for GTV, a National Geographic Society videodisc product. The concept of GTV had been developed by the three groups; MPS was designed to make this concept a deliverable product.

The MPS the system has two major components, the Econodroid and the Back End. The Econodroid furnishes a number of tools for creating and manipulating media objects and creatively assembling them into segments. The central tool is the Time Editor, used to assemble objects in time. The heart of the Time Editor is the time track, a visual track running left to right that acts as the time axis for sequencing all the other events that Econodroid controls. Another element of the system is the Workspace, a time-independent organizing space;. workspace might be thought of as a two-dimensional scrapbook. Objects are represented in the workspace as icons which can be dragged into sequence through the Time Editor.

Once the segments and database materials are done, an additional set of production steps are required in order to produce a final videodisc and CD product. This is the pre-pre-mastering process performed by the Back End. It involves audio compression, building a keyword index, laying out the physical distribution of the data on the CD-ROM, creating the videodisc map and layout, building a new directory of all objects and segments. All of these steps are required to prepare a 9-track magnetic tape pre-master.

MPS was designed to provide a congenial environment for designers who wanted to innovate with still and moving images in a sound-intensive environment.



The general editing environment let designers specify the order of a range of elements, as well as changing the time of each one.

Issues:
What video, audio, and database tools are necessary to create a flexible editing environment for multimedia production?

How can a production system support extensions as newly emerging technologies require it?

How can you efficiently invent new production environments to support new product concepts, and develop both simultaneously?

Observations:
Segments, whether audio or video, are useful units to work with in multimedia production.

MPS was one of the first computer-based video editing tools. The interface designed for it has been adopted or reinvented in many other more recent systems.

Computer support in design of multimedia systems is critical, to support the design process while tracking seemingly endless details.

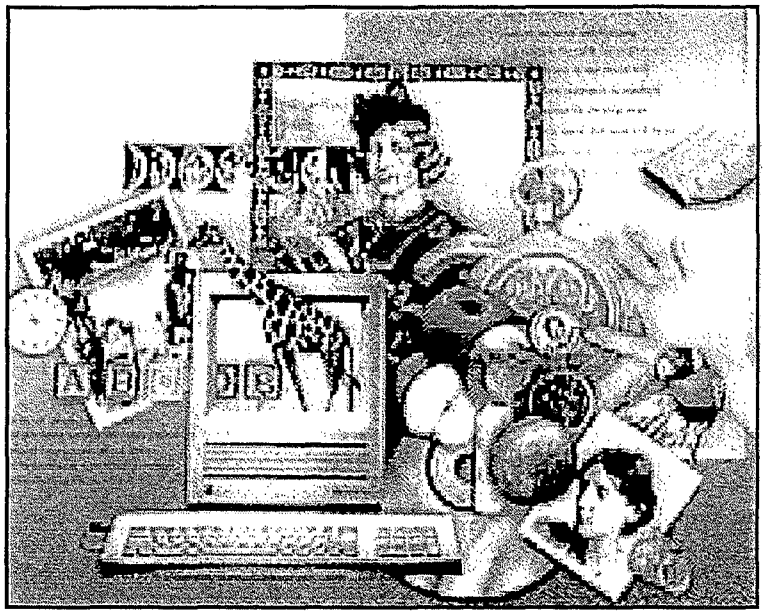
Equipment Used:
Mac II (8MB RAM, 80MB disk), 16-bit color video board, 2 Maxtor XT8760 600 MB disks, 9 track magnetic tape drive, Dyaxis digital audio subsystem (72 MB disk), CD-ROM player, Stereo amp and speakers, 2 laserdisc players, video switcher, Super Chroma video display controller, NTSC color monitor

Developers:
Kris Brown, Douglas Crockford, Bruce McDiffett, Seth Tager, Lucasfilm Ltd.

Materials:
Videotape: Multimedia Presentation System, 1988 Apple Multimedia Group, Technical Report #5

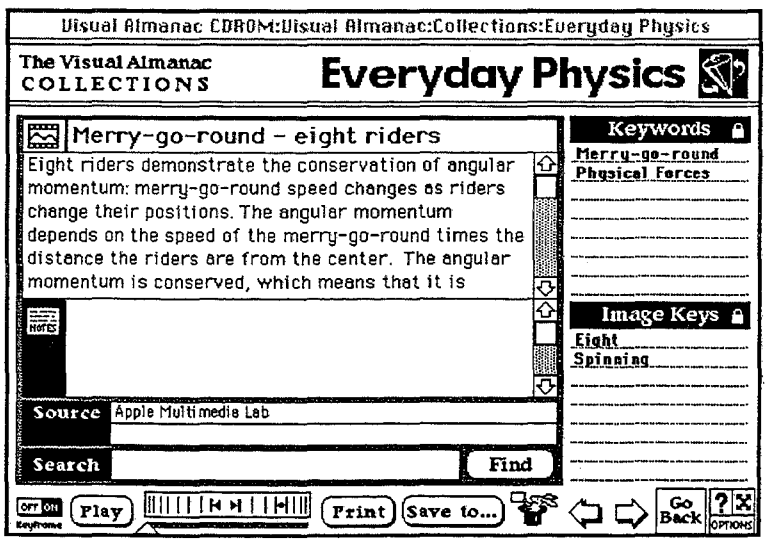
Visual Almanac

The Apple Multimedia Lab produced The Visual Almanac in 1988-89 to give a current day example of the promise multimedia offered. It explored a range of issues including content, interaction, interface, production, support materials and packaging. The final product consists of a videodisc with 7,000 images and sounds, a CD-ROM with 25 megabytes of software, and a highly graphical 200 page book titled *The Companion*. The software is divided into three parts, each reflecting a method of interacting with the images and sounds. These are the Collections, Composition Workspace, and Activities.



This cover image provided a unifying look to the project that was carried throughout the program.

The Collections make up the database where the 7,000 images and sounds are stored as multimedia objects. Each object has a data card with a description, key words, image keys, a controller and annotation capabilities. The data cards are divided by topic into 10 collections. Users browse the collections, saving images and sounds of interest. Once saved, these objects go into the Composition Workspace. The Workspace is where the user stores their personalized "select lists" of objects, to be used later in a composition of the user's own creation. Templates and simple editing tools make the production of compositions easy even for young children.



The fundamental unit in this project was the "multimedia object". Each of 7000 objects was reprosented as a datacard in the program, including a description, a source, keywords, and a notes field.

The third part of the product, the Activities, are professional explorations into the use of multimedia. In an effort to consider how people will interact with images and sounds, the product includes a variety of pre-structured exercises for the user These range from the simple orchestra piece, where the user clicks on instruments and hears their sound, to the Playground Physics activity where users explore the conservation of angular momentum in the context of a moving merry-go-round.

Issues:
What form should media elements take in a large multimedia environment? What information should those media elements carry with them?

What shape should a multimedia product have when it contains large quantities of multimedia objects, composition tools and activities? What does it take to produce it?

What navigational mechanisms make a large product coherent and accessible?

What are the image acquisition issues for multimedia products?

What are the big ideas that can be enhanced by multimedia explanations?

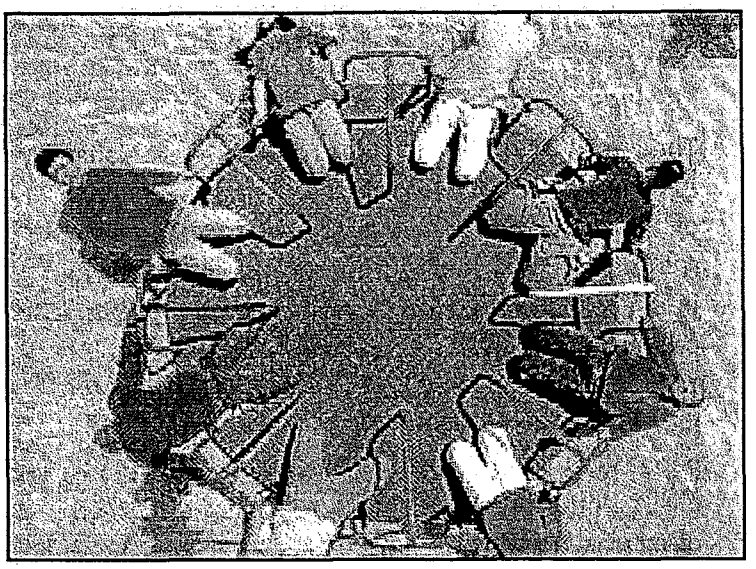
What are interesting ways to interact with images, beyond the usual "click and see"?

Observations:
Schools often use this product as an introduction to multimedia and find demos very helpful for convincing administrators to support multimedia technology.

The activities often acted as stand-alone pieces, providing a nice way for students and teachers to play with multimedia, without taking the time to create compositions.

Equipment Used:
Mac SE with 40 MB hard disk
Pioneer 4200 videodisc player & video monitor

Awards:
International Film and TV Festival of New York: Gold Medal, 1990
Cindy Awards: Silver Medal, 1990



Remember when you played on a merry-go-round as a kid? Did it go faster or slower when you leaned out? In the Playground activity, students can play with their intuitions about angular momentum in order to understand the phenomenon.

Principal Designers:
Kristina Hooper Woolsey, Steve Gano, Kristee Rosendahl, Robert Mohl, Margo Nanny, Nancy Hechinger, Nick West, Sueann Ambron, Fabrice Florin.

Materials Available:
Videodisc product: *The Visual Almanac, 1990,* available from The Voyager Company, Santa Monica CA, 800-446-2001

The Visual Almanac Technical Report, Apple Multimedia Lab, 1991; available through Apple In Print.

Nanny, M. " Interactive Images for Education" in Ambron, S.A. and Hooper, K.S. *Learning With Interactive Multimedia,* Microsoft Press, 1990.

Ambron, S., "Multimedia Composition: Is It Similar to Writing, Painting, and Composing Music? Or Is It Something Else Altogether?", in Ambron, S.A. and Hooper, K.S. *Learning With Interactive Multimedia,* Microsoft Press, 1990.

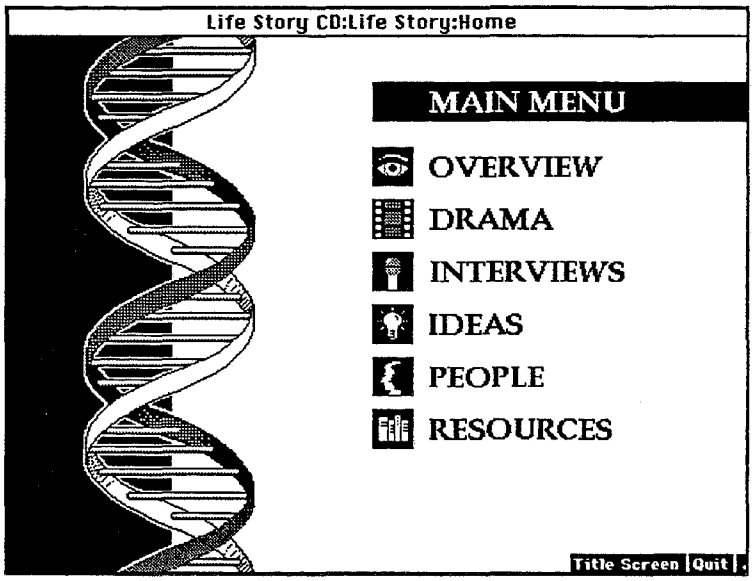
Life Story

This design example is based on the television drama, "Life Story", a 1987 BBC Television production about the discovery of the structure of DNA. The project uses Hypercard and a videodisc to combine scenes from the drama with text, stills, and a range of other elements. The end product is a tool for learning about DNA for high school and college level students. The drama serves as a motivator and stimulus for students to learn more about the discovery of DNA, as well as to present the social and human side of scientific research.

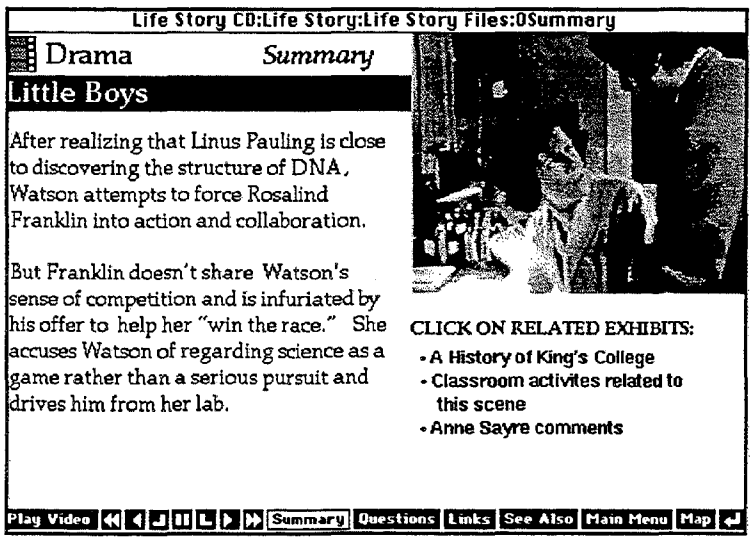
The Life Story design example explored general issues of interface design and methods of information access, information maps, and guides. Its primary focus was the use of dramatic structure in providing a framework for in-depth learning. It examined the general idea that one could take an existing linear drama and provide additional materials to enhance understanding. It also provided a general sense of which classes of drama might enhance multimedia use.

A major challenge in the project was to create a structure for a vast number of interrelated elements, including scenes from the drama, film interviews, an hour of audio interviews, computer and film animations, texts, activities, bibliography, and glossary. A variety of maps were developed to provide coherency. A plot map was represented as a double helix and showed the entire drama at a glance. A concept map allowed users to browse by ideas. A visual index allowed viewers to navigate by choosing among images.

In addition to maps, each key scene and its related subjects were documented through four-part pamphlets. A "Summary" card described the scene or topic and gave its contents in the form of a list of exhibits. The "Links" screen highlighted related



This prototype provides teachers with multimedia materials to enhance classroom interaction.



For each scene in the original movie, a range or supporting material is available in a standard pamphlet structure.

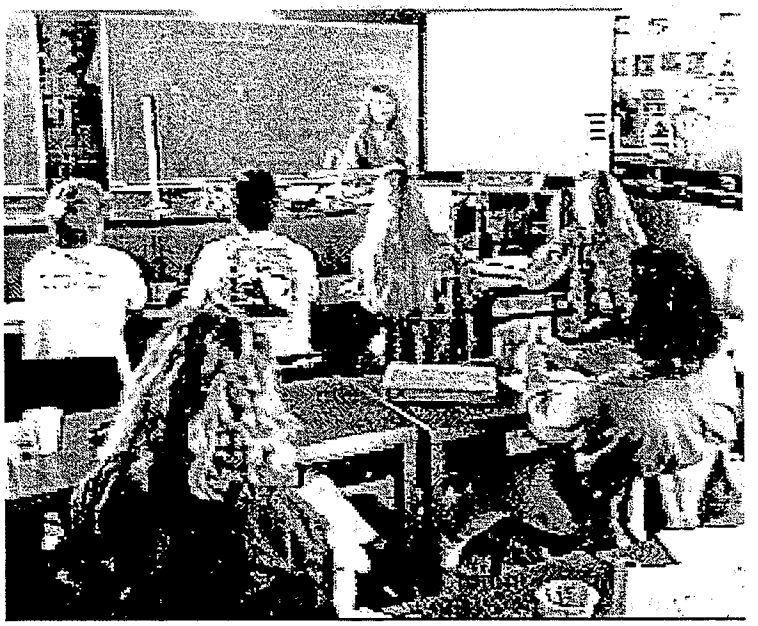
pamphlets. "Questions" offered frequently-asked questions about the scene or subject, along with hints to research the answer. A "See Also" card gave more options, listing external resources such as articles, books, and films. The general pamphlet structure integrated the entire project.

This project also illustrated a method by which the user could query a video frame. With the use of a graphic overlay card, users could click on a picture to find out more about the people or objects in the scene. For example, in one instance, when the user clicked on a character in the drama, a narrator whispered a few words of information about the person and offered an interview of the real person portrayed in the scene. Clicking on the X-ray diffraction camera in one scene called up an animation showing how it works.

The project also explored the use of guides. An on-camera commentary by Jacob Brownowski helped weave another strand through the Life Story drama and its surrounding material. And in a deliverable prototype, a guide was used successfully to show how the program was structured and how it might be used.

In a classroom setting, this system has been used in the context of various teaching models. As a delivery system for large groups, it enabled teachers to illustrate points, to have quick access to information, and to drive discussions. In small groups, it became an interactive resource by which students could revisit scenes of the movie, compare them to related information from the real characters, discuss points of interest, and use the system as a guide for their hands-on activities.

The importance of a well done drama as the backbone to such a system cannot be underestimated. The power of a good story and compelling characters gives learners a context for their thinking, and the motivation to learn more. It demonstrates one possible way to integrate hard science with the human stories of the scientists themselves.



Students gather a range of different materials related to the drama.

Awards:
1st Place: Film Festival of New York 1990
1st Place & Best of Show: Cindy Awards 1991

Equipment Used:
MacII with CD-ROM Drive
Pioneer 4200 Videodisc Player
HyperCard

Collaborators:
Apple Multimedia Lab, Smithsonian Institution, Adrian Malone Productions, and Lucasfilm Ltd.
Co-Producers: Fabrice Florin, Rob Semper, Ed Bastian
Executive Producers: Steve Arnold, Kristina Hooper, Adrian Malone

Materials Available:
Videotape: Life Story, 1988
Florin, Fabrice: "Information Landscapes" and Semper, Rob: "Hypercard and Education: Reflections on the HyperBoom" in Ambron, S.A. and Hooper, K.S. *Learning With Interactive Multimedia*, Microsoft Press, 1990.
Product: *Life Story*, WINGS for Learning, 1992: 800-321-7511

Preschool

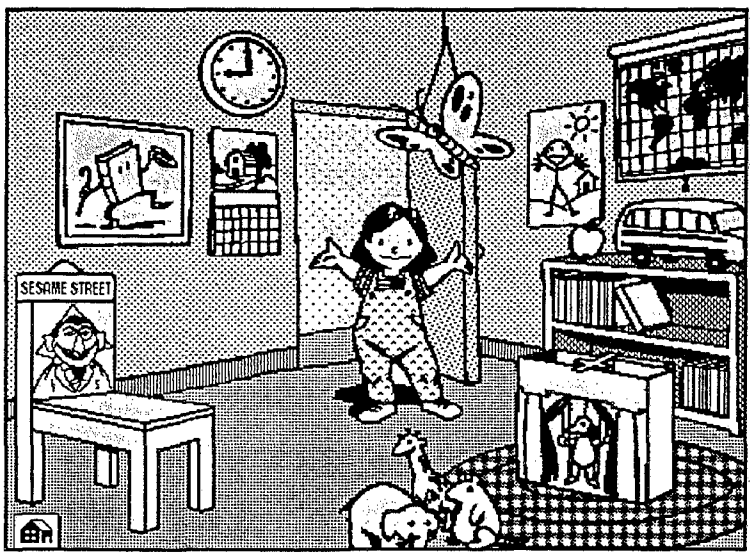
This design example demonstrated that multimedia materials could be incorporated easily into preschool curricula, adding to the environment rather than distracting, as technologies often do. The task was to create a "Magic Classroom", a preschool class which comes alive through interactive images and sounds. The classroom would provide a number of activities, showing how computers can be used for more than simply typing, drawing or delivering movies.

One concept was the "dancing story", a segment which encouraged the large movement activities that four year olds find engaging. To begin a dancing story, the student chose to go either to the beach, the zoo, or the moon. Since preschoolers typically don't read, choices were shown graphically with voice-over narration. Once a choice was made, the users picked an animal or a character to feature, and the system put together a short "dancing story", a piece of video that includes pictures of real horses, crabs, etc. according to the children's choices. The story also included pictures of children dancing on the screen as though they were horses or crabs. It then invited the children in the classroom to dance along with their custom movie.

The system also included an electronic fieldtrip where the students could view the world outside their classroom and neighborhood. The activity focused on children presenting their worlds to each other. Included are pictures of children's houses, their own description of their environments, their drawings, and photographs of the children and their families.

Other activities included Musical Animals, where the children could create songs using standard notation, only to have the notes play back as animal sounds. Also included was an animal sound

In the Dancing Stories activity, young children danced along wiht a video story they had created on the computer.



A fanciful "magic classroom" provided children and adults with easy access to a diverse set of engaging activities.

guessing game, and an animal parts game. Math concepts were explored in a matching game.

Issues:
What multimedia materials are appropriate for preschool use, where reading is not required?

What are the models of such use? How might one design a computer interaction to encourage gross motor movements?

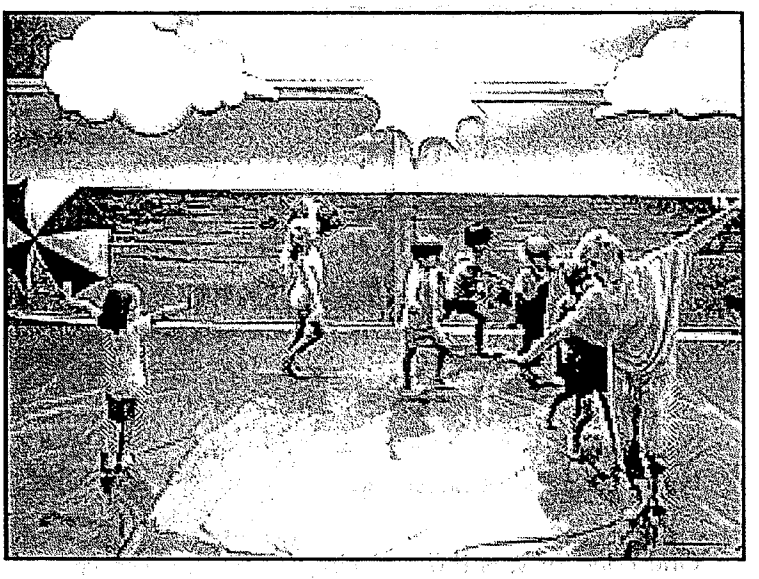
How can technology support storytelling, math, and social activities for very young children?

Observations:
Preschool students used the materials readily; multimedia proved quite accessible to this age group. Images and sounds were readily engaged and the general use of the computer was mastered quickly.

Equipment Used:
Mac SE with 20 MB hard disk
Videodisc player and video monitor

Designers:
Laurie Bauman, Janice Van Collie, Kristina Hooper Woolsey

Materials Available:
Videotape: The Magic Classroom,1988
Jenkins, Yolanda "Multimedia Technology: Tools for Early Learning" in Ambron, S.A. and Hooper, K.S. *Learning With Interactive Multimedia*, Microsoft Press, 1990.



Original video production of structured movement exercises made up part of the Dancing Stories activity. A commercial videotape, "Baboons, Butterflies, and Me", was based on this production and distributed by The Nature Company.

Disappearing Ducks

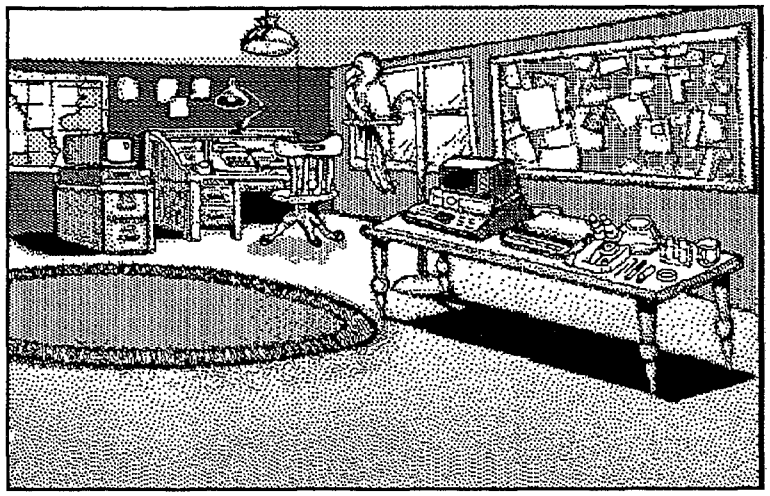
This project was based on the premise that a class of high school students would know how to design something engaging for their peers—and indeed they did. Working with professional designers from Lucasfilm Ltd., the students created an entire mystery around a befuddled character named Paul Parkranger. A naturalist, Paul left his cabin with an unsolved case of vanishing wetlands on his desk. It was the students' task to take over the case and solve it.

The content for the project was drawn from a TV special on wetlands created by the National Audubon Society. This material, which included out-takes not used in the special, gave students a broad range of images and information to use in their interactive environment.

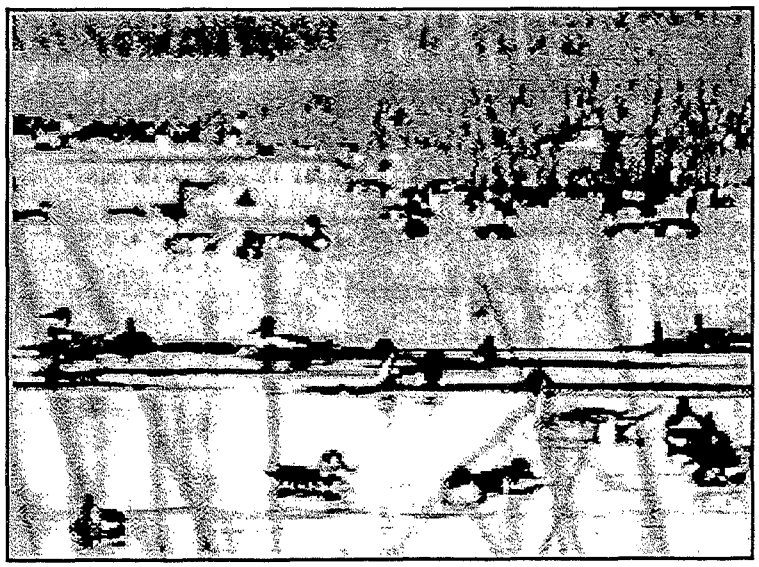
Combining the content with the mystery and a dramatic character was highly effective. Users entered the environment by approaching Paul's cabin from afar, hearing their own footsteps as they went. Once inside, the user found notes on the desk which were read by Paul's voice, explaining the environment and the mystery to be solved. Users could browse around the cabin doing research, looking for clues as to why the wetlands habitat was vanishing. In the file drawers, for example, there were profiles and interviews with people representing various viewpoints.

On occasion an antiquated videophone would ring and through the crackle of radio interference, students would hear some silly narration from Paul as he offered hints and suggestions for their sleuthing.

The interactive environment also provided an alternate entry to the same materials through "Resources." Here the user had direct access to



This story centers around Paul Parkranger's cabin. Here are the materials students need to solve this ecological puzzle.



The topic of the program is the disappearance of ducks in a changing ecology.

available interviews, visual material, anatomical information, glossaries and environmental agency listings.

The overall spirit of in this particular design example was fanciful. In a large part, this was accomplished by a personable character and the sensitive use of sound, which set the stage for the activities and established a close relationship between the viewer and the materials.

Issues:
Can a group of high school students effectively design materials for peer instruction?

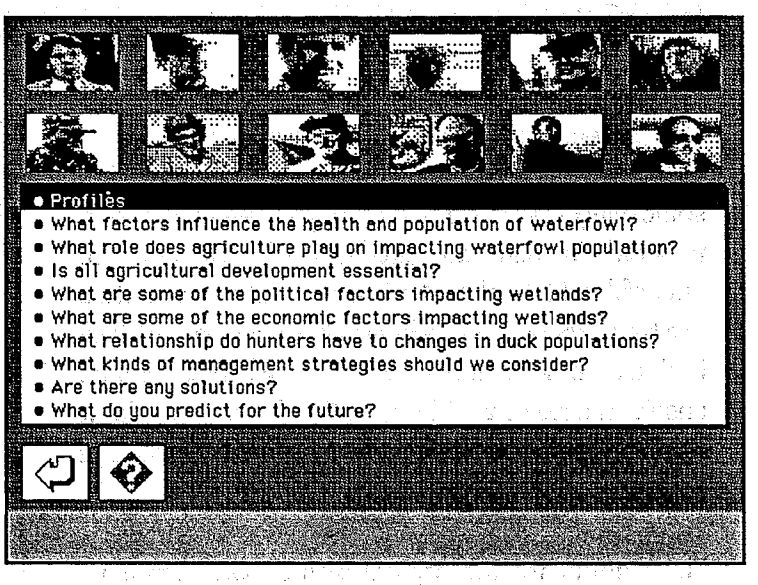
Might dramatic characters and a mystery story help motivate the understanding of scientific concepts?

Can the materials from a television program (including the out-takes), be used to develop an interactive product?

Observations:
High school students learned a great deal of biology in developing this project. This suggests that the major learning experience in these materials lies in the process of their creation This may imply that we should make curriculum building part of classroom activities.

The interview format developed for this project proved to be a classic, as students could query a range of experts on controversial ecological topics.

The use of music and mystery to give this project some attraction was very successful.



This now-classic format encourages students to "interview" a range of experts on a set of topics. This provides direct experience with opposing views related to the individual's perspective on the situation (eg. farmer and hunter).

Equipment Used:
Mac SE with 20 MB hard disk
Pioneer 4200 Videodisc Player
Video Monitor

Collaborators:
Apple Multimedia Group, Lucasfilm Ltd., National Audubon Society, 1988

Designers:
Students from Marin Academy High School, David Lawrence, Karla Kelley, Craig Southard

Materials Available:
Videotape: Paul Parkranger (1988)
Product: Paul Parkranger and the Mystery of the Disappearing Ducks, 1992, Coronet/MTI Publishers, 800-621-2131.

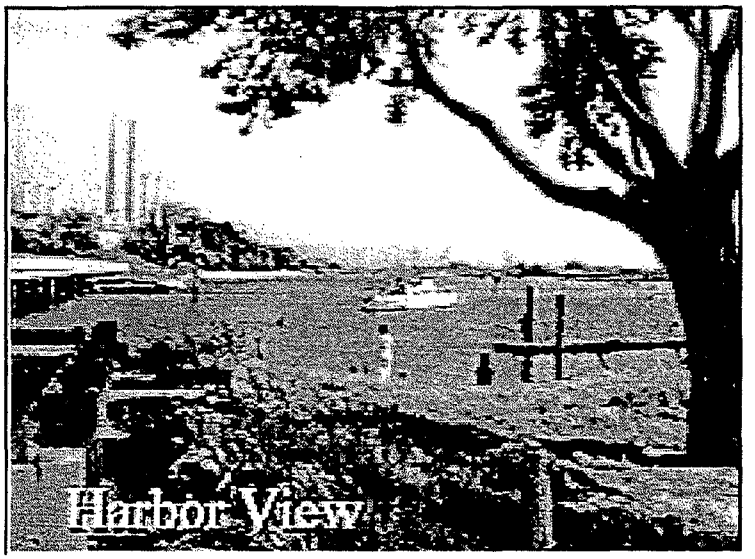
Moss Landing

This project considered how people might gather information "in the field", using cameras and other data acquisition devices, as materials for multimedia use in a Macintosh environment.

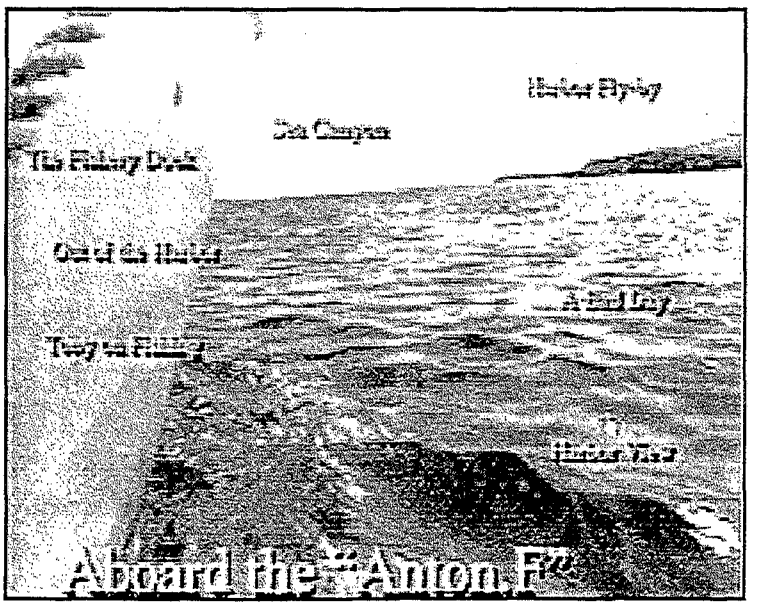
The concept was that any "place" has basic issues which are of interest to people all over the world (including political, environmental, economic, social, and cultural issues.) The challenge was to show that an interactive computer environment could link these global issues easily from place to place. A second focus was to examine current methods of filmic and data gathering styles (shooting, recording, logging, editing, presentation) to find the one appropriate to bringing materials from the camera to the desktop.

We asked a variety of professionals—tv news people, sound designers, scientists– and a range of photographers from different disciplines (nature, underwater, surrogate travel, and cinema verité) to record their perspectives on a small California coastal town. After 3 days of gathering material, we logged and organized the results into a coherent whole.

We established a linked database of video materials, allowing viewer exploration in a number of ways. Viewers could identify and link the dfferent segments as they chose. Keywords enabled them to navigate by choosing particular themes or elements. Viewers could also choose to experience the town through a widely diverse set of "lenses", including an interview with a local girl, a walk through the fish market, the sounds of a salt marsh, or the view from a helicopter. Users found the materials very compelling. Even if they had never been to the town, they started to understand its "reality" and feel a part of it.



This "hyperpicture" lets one choose a number of different views of the town.



Clicking on any text label connects the viewer to a new sequence.

Issues:
What techniques and special devices can be used to facilitate gathering material in the field for the creation of interactive systems?

What kind of images and sounds are most useful in an interactive system? How might one attach this data?

In shooting for linear presentation, field people know what they have to get. What are the comparable guidelines in developing interactive materials?

Observations:
The logging requirements for this kind of project are incredible. Three days in the field generated enough material to keep loggers busy for years. Logging and editing methodologies must be developed to make the acquisition of materials a manageable task.

In some cases, we found that gathering too much was worse than gathering too little.

Notetaking in the field frequently did not work well with current methods and equipment. Notetakers were constantly distracted by the many things going on around them, and were typically unconvinced that their role was critical.

This type of project proved a promising way for towns to represent themselves for purposes of city planning or historical documentation. Local groups are also intrigued with how they can use this technology to show their towns, and to introduce students to larger global issues of environment and planning .

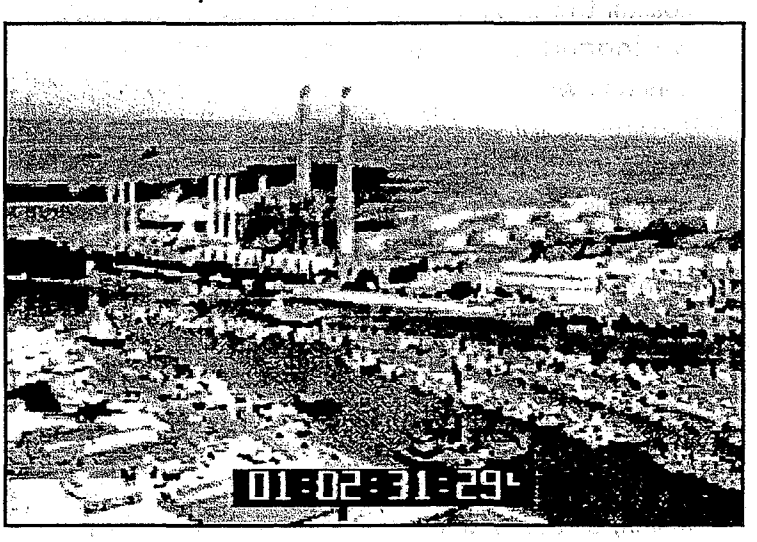
Equipment Used:
MacIIci
SuperCard
Audiomedia board
Orange Micro Video card
Two Pioneer videodisc players

This linked video presentation is a candidate for future high-tech postcards.

Two CDROM drives

Lead Designer: Fabrice Florin

Materials Available:
Videotape: Moss Landing, 1990
Florin, Fabrice: "Information Landscapes" in Ambron, S.A. and Hooper, K.S. *Learning With Interactive Multimedia*, Microsoft Press, 1990.



Overviews from a helicopter contextualized other eye-level views.

Multimedia Presentation Resource

The "Multimedia Presentation Resource" began in Spring 1989 as a custom presentation created for Kristina Woolsey and Sueann Ambron to brief the press on Multimedia. The original version offered an orientation on different aspects of multimedia, including some history, examples of current work and implications for future developments. The project was then transformed into a flexible, public presentation suitable for a variety of audiences and presenters.

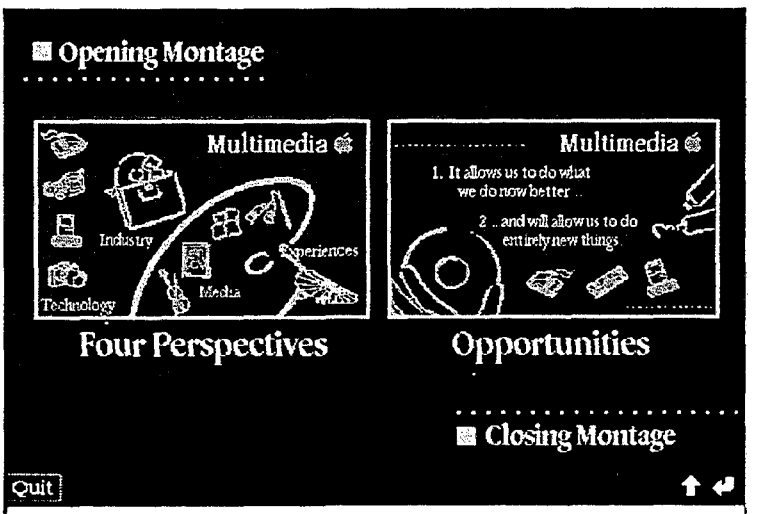
The final version was much simpler than the original. It consisted basically of two parts. In the first, the presenter could approach the materials through four topics, including technology, industry, media or experience. In each of these sections an introduction to the topic was provided, and a set of examples relevant. In the second part of the program, multimedia was considered as an evolution ("it allows you to do what you're doing better"), and as a revolution ("it allows you to do new things." Historical clips and interviews supported the second section.

Both were accessible to the presenter through a menu. A front end described just what the presentation was and how it might be used. There was also an audio "guide" function, which demonstrated one possible presentation format and commented on some of the material. In addition, a "behind the scenes" element included text descriptions of the materials and listings of the video elements, so they could be directly accessed from any location.

Issues:

Can multimedia materials developed for a custom presentation be used on a larger scale by a number of different people, many of whom are unfamiliar with the topics being presented?

A basic orientation was provided to prepare new presenters for delivering their personalized speech



This main menu provided access to all sections of the program

What are the interface issues involved in transforming a personal presentation into a more global one?

Observations:
It was difficult to develop this idiosyncratic product into a universal presentation, though the use of a guide mechanism and some explanatory notes proved useful in briefing people.

As a culture we demand that speeches—in contrast to other media—be both highly personalized and up-to-the-moment, especially in technology arena. This makes it critical to consider both personalization and updating mechanisms for such presentation resources. Alternately, it requires that messages be general, and fairly timeless in content - a category that is more applicable to education than business.

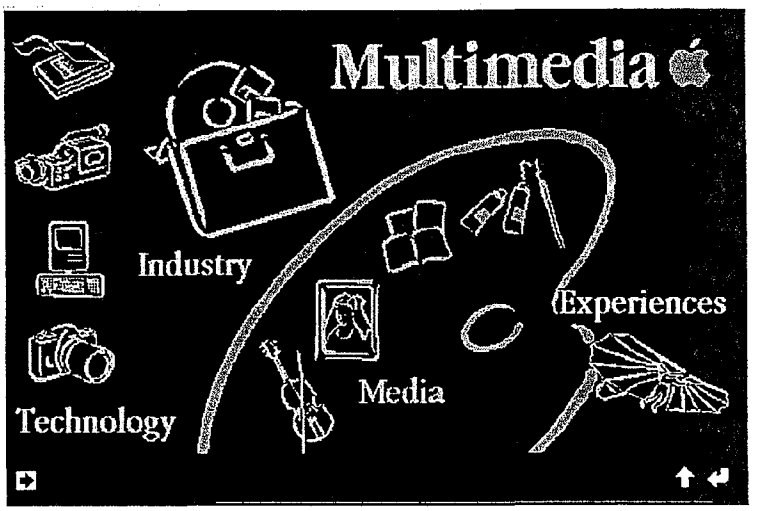
When presenters turn to public multimedia presentation tools to create their speeches, and produce them without the aid of media professionals, we'll have a new communication form in our everyday culture. Otherwise we've simply gained another professional media delivery system for well-supported presenters at well-funded events. This is exciting, but certainly not culture transforming.

Equipment Used:
Mac II, RGB Monitor
HyperCard
Pioneer videodisc player, Video Monitor

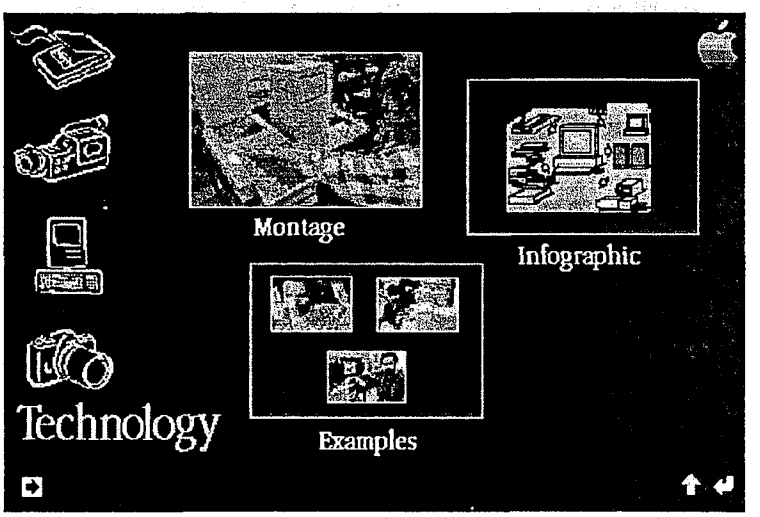
Availability:
In-house prototype only.

Designers and Producers:
Kristina Hooper Woolsey, Sueann Ambron, Steve Gano, Kristee Rosendahl, Burt Arnowitz

Thanks to Mary Fallon for organizing the press briefings for which this was designed.



Four different perspectives were offered on the topic of multimedia, each providing quite a different understanding of the topic



For each perspective, the system provided a brief overview, a summary infographic, and a set of examples.

Restructuring

This project was a collaboration between the Apple Multimedia Lab and the Center for Restructuring at the American Federation of Teachers (AFT). The goal was to create a multimedia system that would enable AFT to present its philosophies to its constituents, and to familiarize people with the many aspects of educational reform. The project presents five entrances into the information. *Topics* focuses on areas such as curriculum, learning, accountability, and assessment. The *Case Studies* section investigates what some schools across the country are doing. The *Issues* section addresses such questions as, "What are the pros and cons of interdisciplinary curricula?". *Stories* offers a range of personal accounts from the field. *Resources* contains a collection of reference materials, including over 100 articles and documents that are linked to different parts of the program.

The product can be used as a presentation tool, a training environment, or a reference tool. Users can explore various topics, create their own personalized videotapes, and print out articles and documents.

Issues:

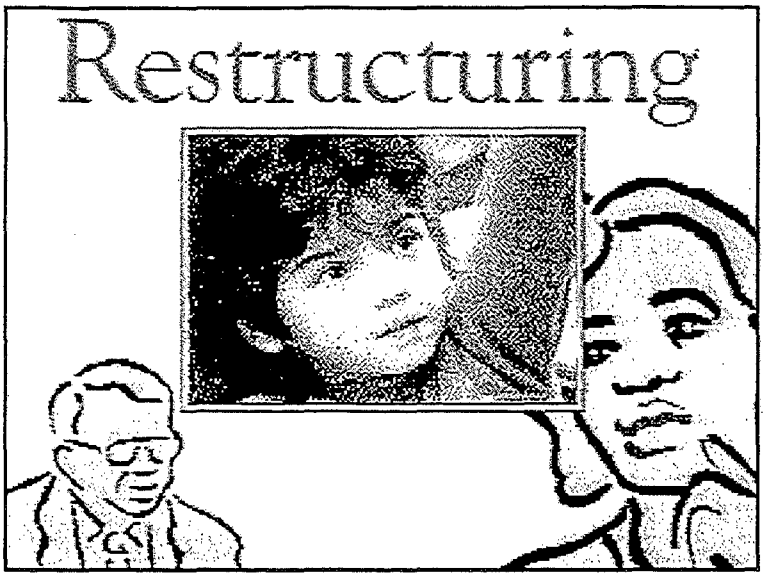
How might a professional organization use multimedia to distribute information philosophies and points of view to members in various locations?

How might one organize and present information about school restructuring to a teacher/administrator group?

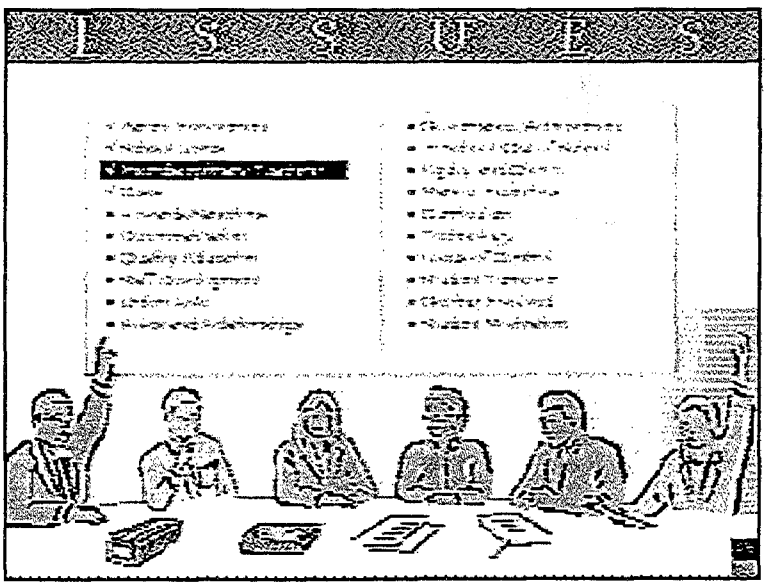
What are the interface issues in creating a compelling environment around audio interviews?

Observations:

The *Issues* section has become a new interface model for developing conversations and arguments



The introduction to the program establishes a conversational and argumentative tone, encouraging users to enter into the problem of restructuring



When a computer user selects an issue, a range of caricatured screen presences offer their opinion by raising hands.

outside of the immediate computer environment.

The *Stories* section is useful as a model of how technologies can extend the oral traditions of our culture.

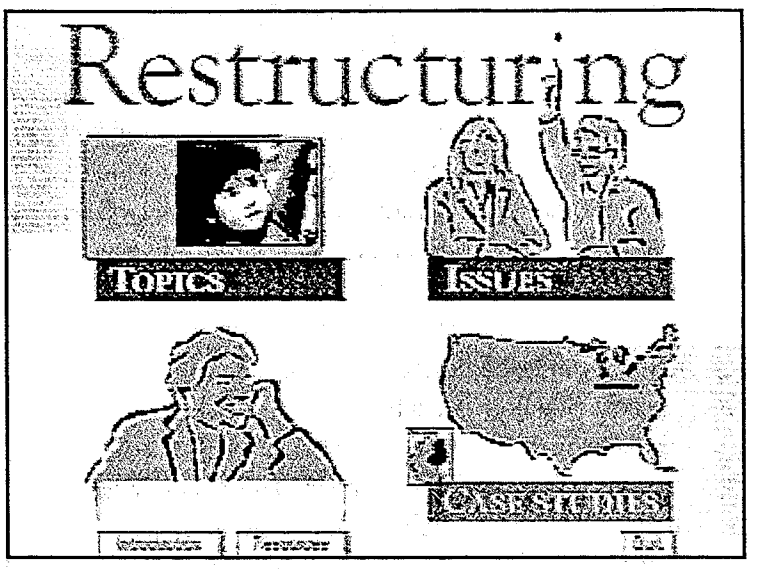
In demonstrating this prototype, one finds that people begin arguing with each othe about the issues, and leave the video behind for a while. This is a success.

People expect the computer to have cookbook answers to educational dilemmas. They look for easy fixes. In some situations, it was impossible to overcome this desire and engage viewers in argumentation. In others, this approach provided some necessary magic in encouraging viewers to approzch their own local issues from a new perspective. With technological advances, viewers can add materials- particularly case studies and stories- to a system like this, and make their additions available over networks.

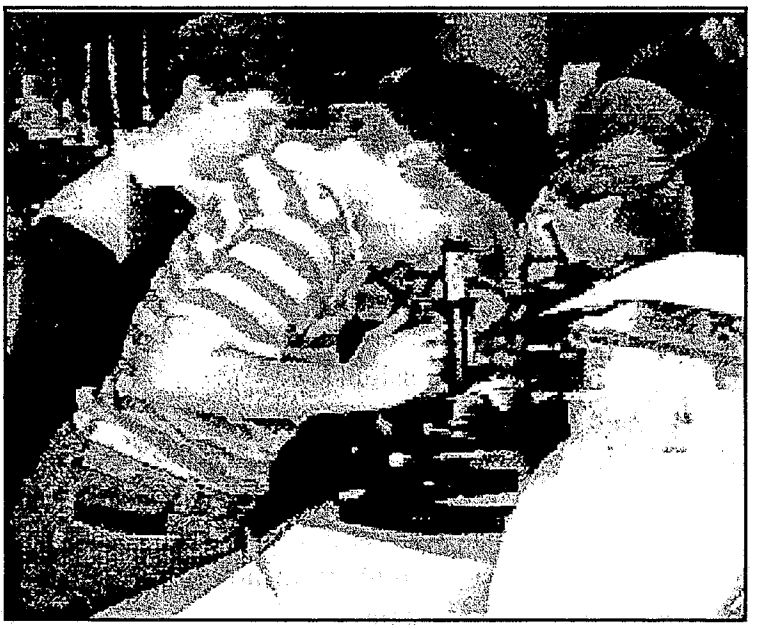
Equipment Used:
Mac II with 80 MB hard disk
SuperCard, CD-ROM, videodisc player and monitor

Collaborators:
AFT Center for Restructuring and the Apple Multimedia Lab

Designers and Producers:
Kristina Hooper Woolsey, Bill Purdy, Marsha Levine, Bruce Goldberg, Burt Arnowitz



The basic sections of the program are accessible to view through this main menu.



This prototype deliberately furnishes both concrete examples of students learning and abstract issues of political argumentation, hoping to encourage people to consider both.

Globe Project

The goal of this project was to examine the use of multimedia in a public space environment. The central venue was an exhibition space to be developed as part of the Globe Theater's reconstruction on its original London site.

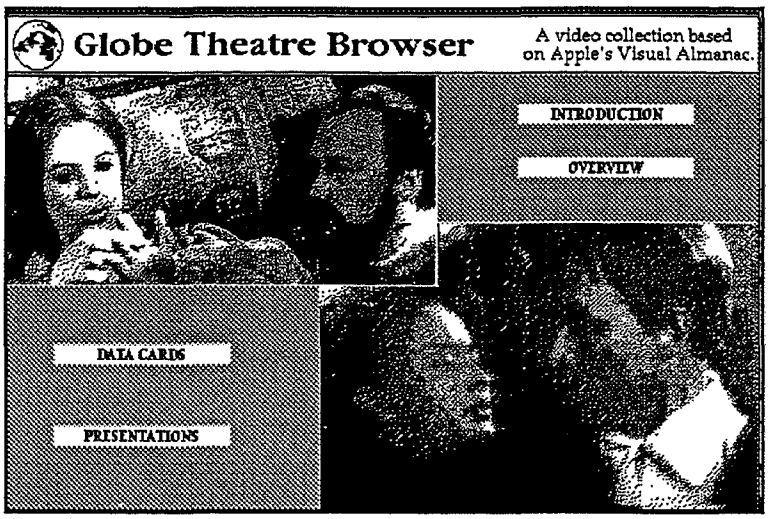
Among the main features:
A series of multimedia exhibit ideas presenting aspects of the Globe theater to the public; these included the nature of Shakespearean theater, observing the theater from multiple points of view, London at the time of the old Globe, and the "Living Variorum", a multimedia research tool .

A series of technical and design examples examining the use of multimedia hardware and software in a 3-D space. These included multiscreen presentations, mixed software platforms, large screen projections, and group multimedia activities.

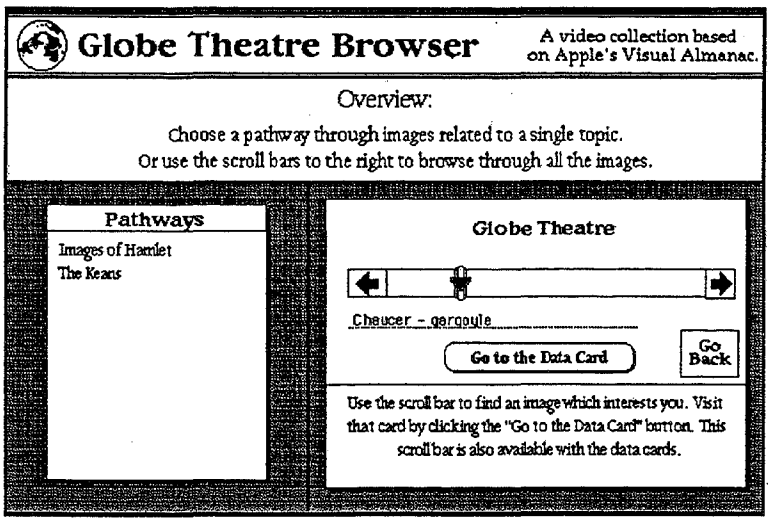
An interactive multimedia design portfolio that serves as both a design and presentation tool.

Incorporation of elements from the Shakespeare Project material (an existing HyperCard/videodisc project), video material from Thames Television Productions, and archive images from London stage archives.

Issues:
What might be the relationship of public space and its attributes to multimedia exhibits? How can groups interat with multimedia systems? Are there natural ways of integrating electronic systems into exhibits, particularly historical exhibits? How might one use a variety of screens and input devices in a public environment? Are there opportunities for take-home multimedia?



This prototype encouraged viewers to gather information about the Globe Theater.



A general-purpose browser provided direct access to specific materials and images; it made use of the collection structure produced initially for the Visual Almanac product.

Might multimedia systems simulate visits to a public space environment to allow for new design and presentation tools?

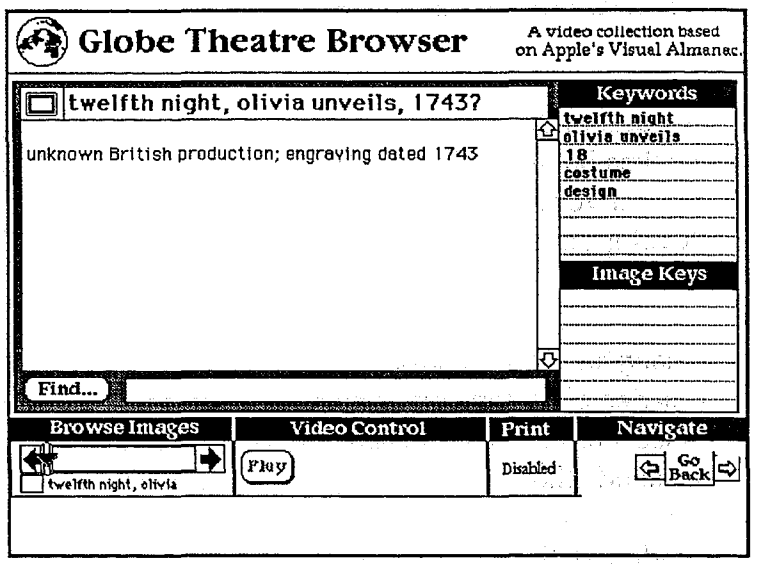
How might one develop useful tools for academic research using video, audio and text interactively?

Observations:
It is possible to extend multimedia system applications in public spaces beyond the standard monitor and computer kiosk. The integration of the system into the exhibition is critical.

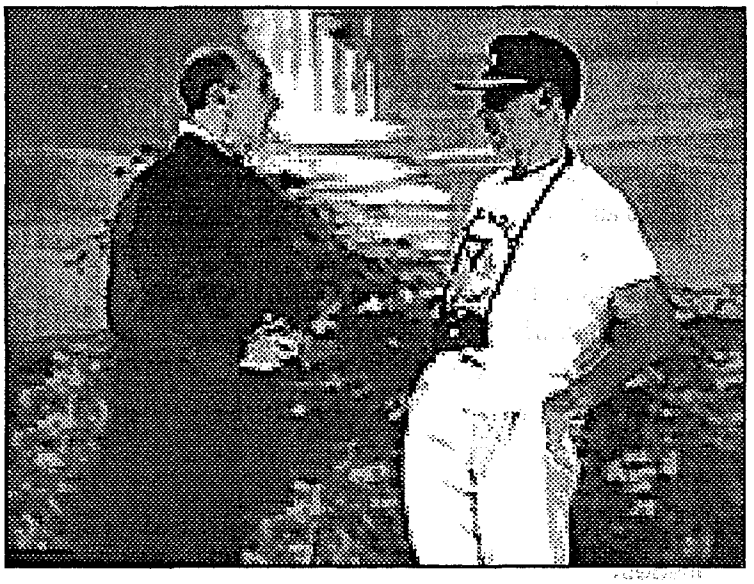
An interactive design portfolio can be a useful design aid as well as an effective presentation tool.

Designers:
Larry Friedlander, Rob Semper, Pat Roberts, Michael Korchuska.

Equipment Used:
Mac II
Write-once videodisc system
Photovix slide to video transfer system
MassMicro Colorspace II video display board
Macromind Director, SuperCard, HyperCard



The Visual Almanac format allowed viewers to access materials by keywords and a basic HyperCard "Find" function.



Using simple video overlay functions, a visitor can play a role opposite an actor's performance; a videotape record of their interaction can be taken home.

Future Worlds

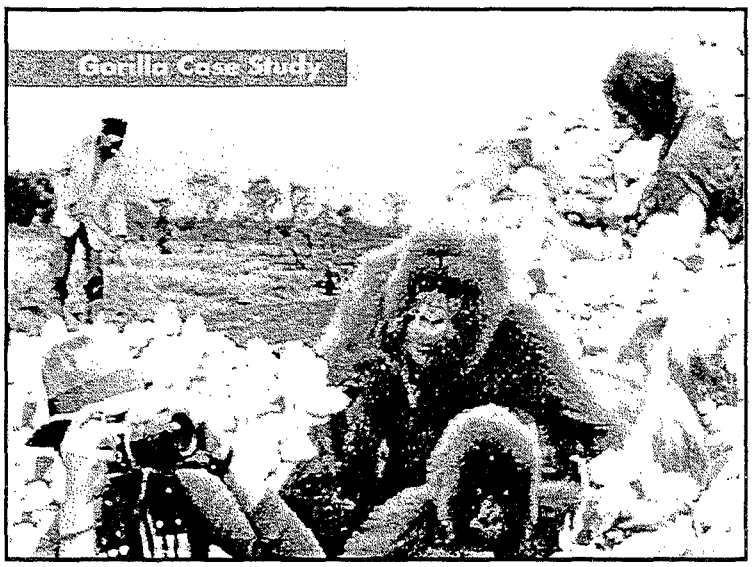
Background

Future Worlds is a design example which explores multimedia composition in an integrated media environment. It is the result of a collaboration between the Apple Multimedia Lab and the Interactive Television Unit of the British Broadcasting Company.

Future Worlds was a television series proposed by the BBC. The premise was for six experts to give their views of what the world will be like in the year 2025. Each expert would author an interactive multimedia essay; the broadcast program would be one path through each essay.

The interactive product would contain the essays, a database of all of the media objects used in the essays, and tools and templates for the reader to take the essays apart and create their own from the collected elements.

Future Worlds became the second example of what we now call a "modular publication".

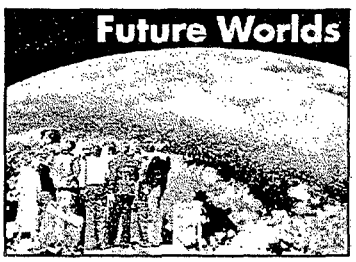


In a "dynamic pictorial space" the multimedia objects are animated cutouts, instead of the rectangular buttons in Visual Almanac compositions.

Design Approach

In our earlier Visual Almanac project, multimedia compositions were HyperCard stacks; media objects were displayed as "buttons" which played analog video on a separate screen when clicked.

Future Worlds takes this basic concept and explores new possibilities for the graphical portrayal of objects in a display where digital video and graphics can mix freely. One such portrayal style is the "dynamic pictorial space", an animated photo montage (see figure 1). Each object in the composition appears as a cutout which enacts an ambient, looping animation. Every composition has a unique, "site-specific" ambient sound that gives the composition an extra dimension of identity.



Future Worlds begins by introducing the six authors and showing short clips from their essays.

In Future Worlds, we experimented with a number of different portrayal styles. The project presents a catalog of videographic effects that will stimulate thinking and discussion about multimedia publication design.

Description

Our Future Worlds project contains three distinct demonstrations, woven together by a presentation which provides a self-explanatory context for viewing the demonstrations.

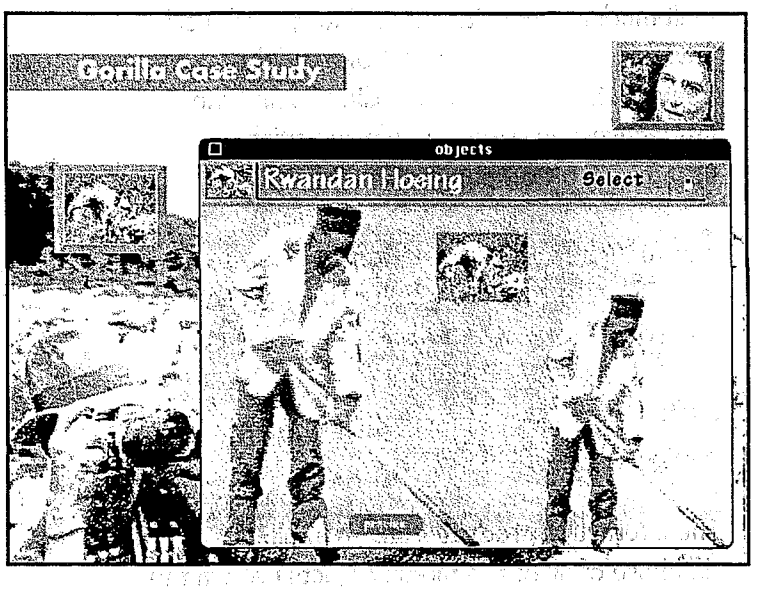
The first demonstration was created by the BBC in 1989. It is a sample essay on the extinction of species as it might have been presented by Roger Wilson, a conservation scientist working with mountain gorillas in Rwanda. The BBC's work included a prototype tool for creating media sequences, which they later developed into a product called MediaMaker, published by MacroMind.

The second demonstration was created by the Multimedia Lab in 1990. Using the same material as the BBC example, it employs more fanciful forms of composition such as the animated photomontage.

The Lab also created a demonstration of how an author such as Roger Wilson, or a user who has purchased Future Worlds, might create their own composition. It shows that dynamic pictorial displays can be created simply from pre-existing elements, in much the same way that children use a Colorforms toy to create a picture.

Production and Tools

Future Worlds was created using both SuperCard and Director, because both programs supported 2.5-D collages of cutout graphical elements. The graphics were also created in those programs, and later in Photoshop. A MassMicro Colorspace FX card was used to combine analog videodisc output with the color graphics. Ambient sounds were created by programmed looping of digital sound resources. The videodisc provides a second track of audio, mixed with the ambient sound by an external manual audio mixer. (Future Worlds predates the multichannel audio of system 6.07 or QuickTime.)



The design example includes a demonstration of how anyone can create a composition by simple, direct manipulation of the animated cutout elements.

Materials Available

Future Worlds is not a product but a design example, one which we are preparing for limited internal distribution in the coming months.

Lead Designers: Steve Gano & Kristee Rosendahl
Collaborator: Max Whitby, MultiMedia Company

Multimedia Lab Research
(1990-Present)

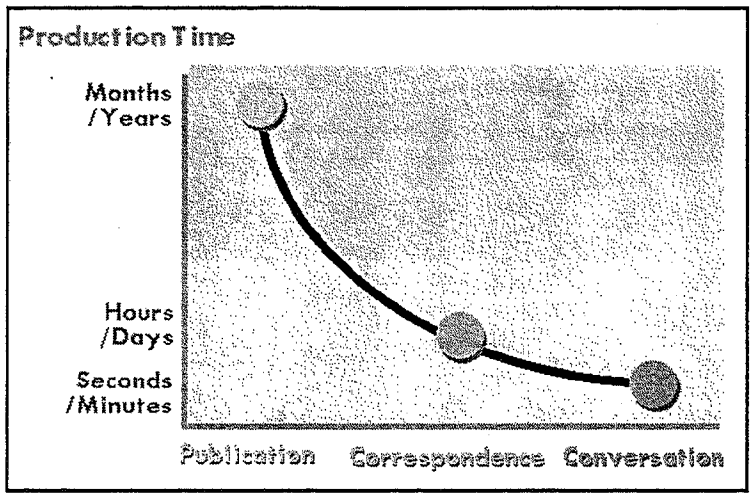
Media Research

Multimedia titles offer audiences imaginative and engaging interactions with images and sounds. Tools included with these titles enable users to select, save and reorganize the provided materials into new forms for presentation.

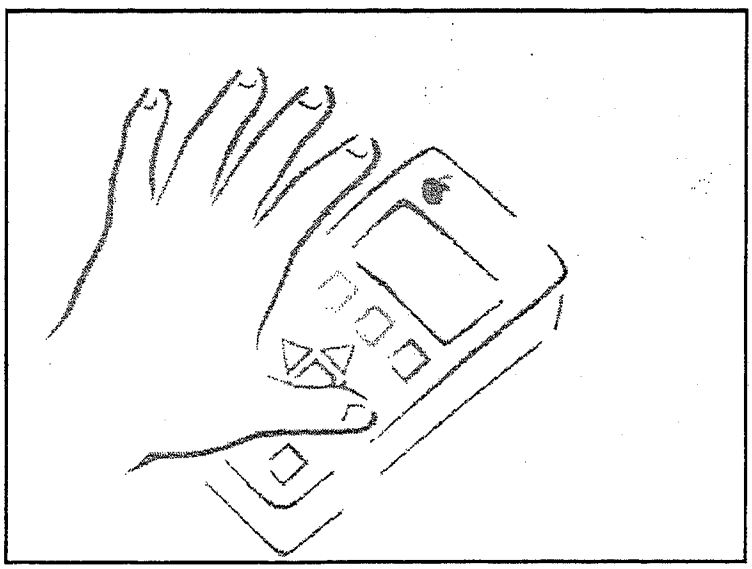
What happens if you extend this constructivist view further? How can everyone be involved in multimedia production, without becoming a professional media producer? What opportunities exist for making the casual, everyday use of multimedia comparable to our current use of word processors? What technologies are needed to extend people's capabilities in multimedia design, to access available materials, and to create new things?

At the core of the Multimedia Lab's approach to these questions is an analysis which distinguishes between publications, correspondence, and conversation. *Publications* are media elements typically produced 'by the few, for the many.' They are public documents, widely available, that take a long time to produce, and which require substantial professional expertise. Books and movies are familiar publications; multimedia titles are new classes of interactive publications.

Correspondence is a different class of media, with a different intention. Here, production takes much less time and expertise, and the surface quality of the material is usually lower. Correspondence is generally designed for a particular audience (often just one person), and is timely in nature, though not necessarily archivable. Letters and voice mail are examples of correspondence. In the multimedia arena we have been developing new classes of this media type, including meeting notes, trip reports and research observations.



In 1987-90, the Lab focused on multimedia publications. Beginning in 1990, we focused on more casual media use—correspondence and conversation—in a distributed environment.



As computer users becoming increasingly mobile, the issue becomes how to create a standard media format that allows the coordination of local, idiosyncratic use and larger, distributed, public information sources.

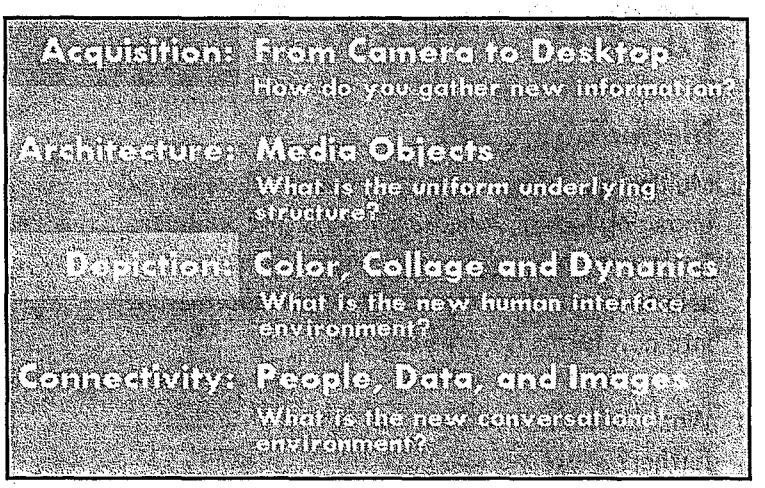
Conversation is our final category of consideration. In the oral tradition, conversation is the normal interaction of everyday life. What happens when we add still and moving images to this process? On a simple level, one has video-conferencing. On a more elaborate level, one can exchange a variety of different media objects across distances. In a conversational mode, people can transmit complex messages in seconds; these exchanges are typically disposable and very task- specific.

This publication/correspondence/conversation axis is the focus of the research of the Lab. Our goal is to bring media into the "casual" end of these categories, allowing quick creation and reaction.

Focus on this axis makes one highly conscious of the importance of both portable devices and available networked services. Through these technologies, we will shift our emphasis from physical, standalone boxes of information, to on-line electronic information available in a range of formats and locations. It will shift the emphasis from great presentations in lecture halls, to casual interactions over a computing device at a restaurant table, or other everyday locations.

We have chosen four basic approaches to casual media use. The first of these is acquisition. One will want to add personal images to those publicly available. We will need new methodologies for systematically gathering images with still and movie cameras, and for organizing and presenting these in a computer environment. Projects have included the development of prototypes such as *The Clipster, The Ross Bulletin Board,* and *The Classroom Multimedia Kiosk.*

The second approach is architectural. If one is going to freely compose with personal and public images and data, there will be an increasing need for uniform representatives and a regular methodology for handling these. We have conducted a range of experiments in this arena, beginning with our *Visual Almanac* product and continuing in the *Future Worlds* project.



Depiction is our third issue. We need standard ways in which media objects display themselves, and conventions for their use. And we need to take advantage of color, sound, and dynamics in doing this for a next generation of human interfaces. Exercises such as *Beads* and *Advent Calendar* offer a context for explorations in this area.

Connectivity rounds out these considerations. In 1991, we began constructing networks that allowed us to move media objects in a distributed environment. We set up a *Lab Bulletin Board* and developed conventions for its use. We also created a set of scenarios, to suggest just how distributed environments might be used.

A new project, *MOM and POP*, was recently initiated to integrate these four approaches, and to provide an underlying structure to support the activities we're experimenting with in each arena. The focus here is on media objects and their portrayal in regular contexts, within a distributed environment. Future work will examine applications which are supported in these environments.

Video Memos

Typically, tourists take a number of photographs (or movies) on vacation. Later, they refer to these to show their great adventure to the folks back home, and save the movies or photographs as keepsakes of important times. This ritualistic process is usually quite casual, both for the tourist and the audience.

Computers can offer an additional tool to enhance this process. Though it is naive to assume they can recreate the original experience, computers can asist in conveying it, especially where we have a specific intent.

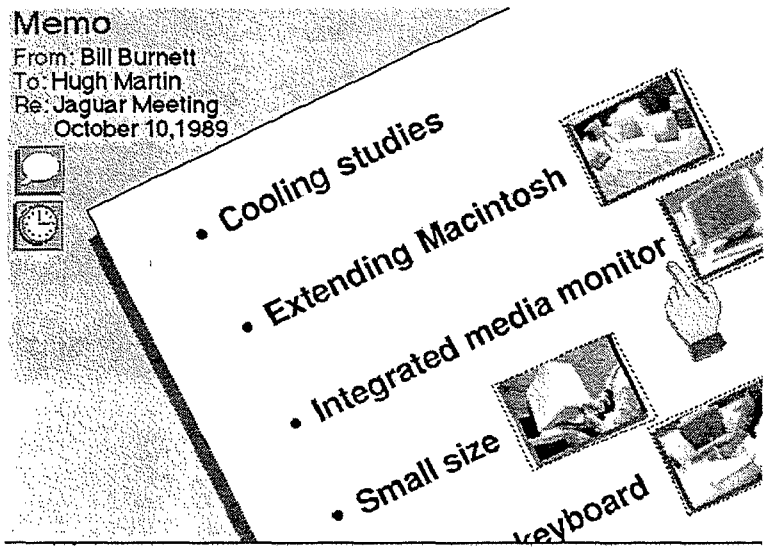
In this project we explored a wide range of different "video memos". We also made a few examples of documents where organized 8mm. materials conveyed an experience; where our hypothesis was that such documents would eventually be produceable in the time it takes to write a typical paper memo (describing a meeting, retelling an event, etc.). This was one of our first efforts at "casual" media use. We contrasted this to professional publications, where experts might produce a movie or interactive multimedia document over an extended period of time.

Issues:

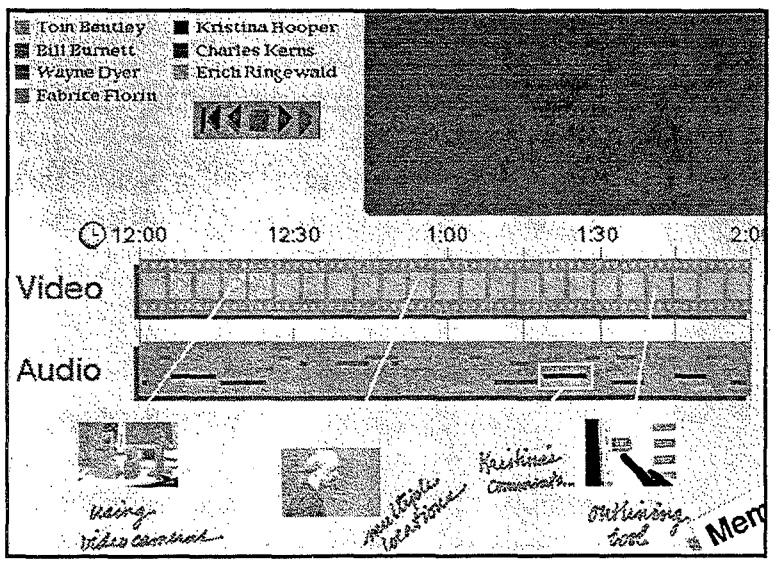
How can the casual use of video enhance communication and help create an effective review of a meeting or event? Are these materials useful for attendess, as well as those not present?

What would a simple template have to look like to accomodate casually shot video quickly and easily for public presentations?

What visual representations (timelines, groupers, webs) are useful for analysis and presentation of video information?



This overview provides people not at the meeting with easy access to available video materials and highlights from the meeting.



In one experiment, three of us documented a small meeting, and then organized our material in a number of ways, including this general time and theme-based interview.

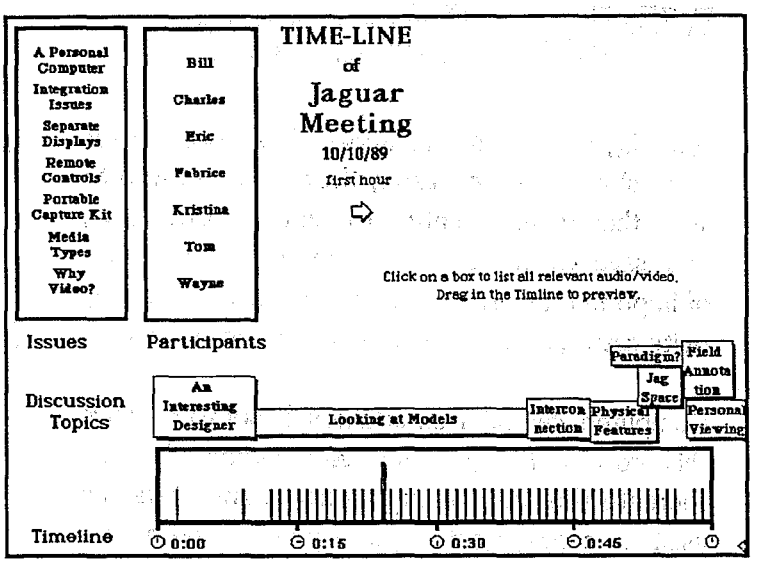
How can a range of visuals and related audio be simply and seamlessly linked in editorial descriptions?

Observations:

Casual use of video extends the moment of an event, making the event replayable later. It does not duplicate the event, but is a useful enhancement to related conversations.

We found that creating video memos and annotations was useful in itself, encouraging reflection and analysis. Yet it became clear that, much like verbal or written reports, the video memos tended toward a highly editorialized view of the event. Some objective encodings, like a timeline record with a complete audio record, provided a good contrast and context for these editorial comments.

With experience, the time taken to construct video memos decreased. The definition of templates for memo-presentation also facilitated initial capture. Interestingly, however, the physical presence of an author, showing the memo in a conversational meeting framework, proved the most effective means for increasing the efficiency of memo construction and presentation. Experimentation with "guides" and remote presentations will follow to investigate this.



This basic timeline allowed viewers to access raw data, as opposed to an editorial view of the material.

Equipment Used:

Macintosh II
SuperCard
Laservision videodisc player
Mass Micro Colorspace FX Video card

Designers:

Steve Gano, Fabrice Florin, Charles Kerns, Kristee Rosendahl, Kristina Woolsey

Aspen KIDS

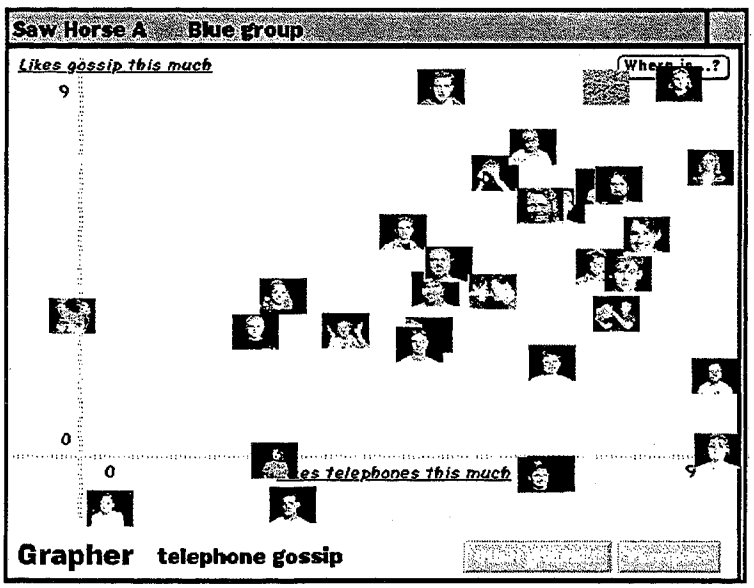
The Aspen KIDS Project was centered around a three-day workshop at the Annual Aspen International Design Conference in 1990. The goal was to explore the potential of multimedia as a fluid medium, where kids could bring objects from the world around them into a computing environment and manipulate them in interesting ways. About 22 children, 10 to 18 years old, participated in the workshop.

On Day 1, the participants created multifaceted representations of themselves to be shown as multimedia objects in the computer. Each one consisted of a short movie, an audio sample, a set of five still images (which were shot to imply animation), and some information (such as "Where do you live?" or "How much do you like homework?"). The information on each person was accessed from a datacard, which the children also designed.

On Day 2, the kids gathered other kinds of objects from the world. Walking around the town of Aspen, they found the letters of the alphabet composed of everyday objects (for example, a telephone pole is a letter "T", a small pond is an "O"), and recorded them. They made a short movie about each object, recorded a sound, and collected data. That evening, behind the scenes, Multimedia Lab members turned these materials into multimedia objects on the computer.

On Day 3, everyone viewed the results of their activities. On a simple level, they could browse through the data cards looking for people or letters of interest. On a more complex level they could use some of the display software designed for this workshop. For instance, a Grapher enabled them to look at people or objects based on different attributes. They might base the relationship on the

Kids quickly mastered the use of video cameras, often showing each other what to do.



This grapher context allowed the kids to see themselves displayed according to a range of attributes.

height and weight of all the participants, or on their preference for classical music versus rock. After each query, pictures of each participant aligned themselves on a graph according to their attributes.

Another software function was a Typer. This allowed users to take the "letters" they gathered in the field and put them together in sentences. Needless to say, the notion of spelling words with objects was very enjoyable.

Issues:
What are the fundamental design exercises relevant to training multimedia producers?

What kinds of multimedia production can be accomplished in a few days?

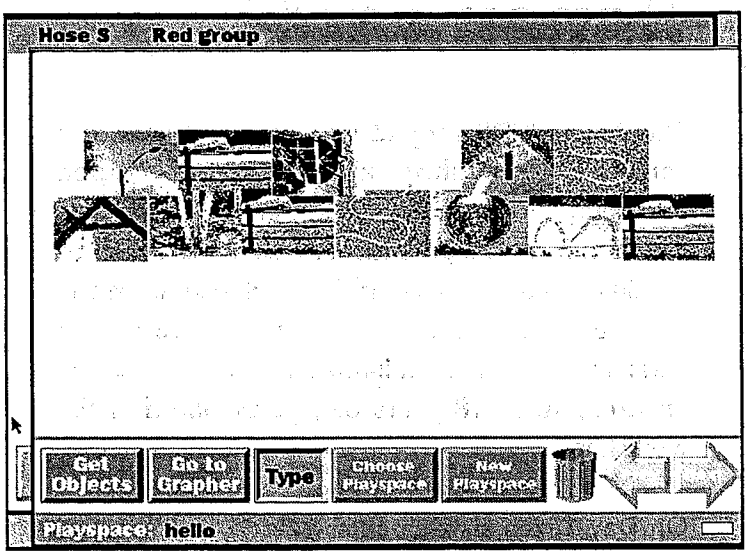
Does the concept of "multimedia object" expand in a fluid media environment? How can different kinds of multimedia objects be used in activities?

As one "brings the world into the computer environment", does one observe the power of this abstract domain?

Observations:
Collecting the letters of the alphabet was simple to understand, open-ended, and yet constrained enough to be done in a short time. It is a very good introductory activity for this medium.

Students went out in groups to collect the letters, using walkie talkies to communicate. This turned out to be an unanticipated highlight of the activity, as the groups could work together at a distance to be sure they got each and every letter.

Cameras and other data-gathering devices bring personal objects into the computer world, allowing the user to explore, manipulate, and compose. These can complement the more public objects acquired from outside professional sources.



This typer context allowed the kids to play with the images they gathered on Day 2 in a fanciful way. (This spells "red is awesome")

In 1990, it took a great deal of professional adult computer support to make this activity effective for kids. Recent developments (e.g. Quicktime) make this activity directly accessible to kids using standard technologies.

Equipment Used:
Mac II
Panasonic write-once videodisc players & monitors
Audiomedia sound cards
RasterOps video card
Sony Hi 8 Video cameras
Audio tape recorders and microphones
SuperCard

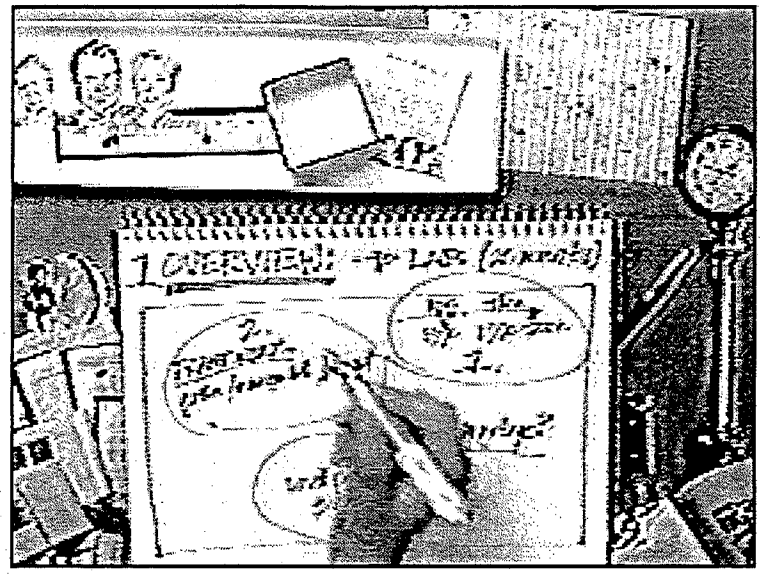
Designers:
Kristina Hooper Woolsey, Margo Nanny, Bob Mohl, Charles Kerns, Steve Gano, Kristee Rosendahl, Fabrice Florin, Nancy Hechinger, Catherine Boyle

Materials Available:
Videotape: Aspen Design Conference, 1990. Available through Apple Computer Video Fulfillment Program.

Desktop Drama

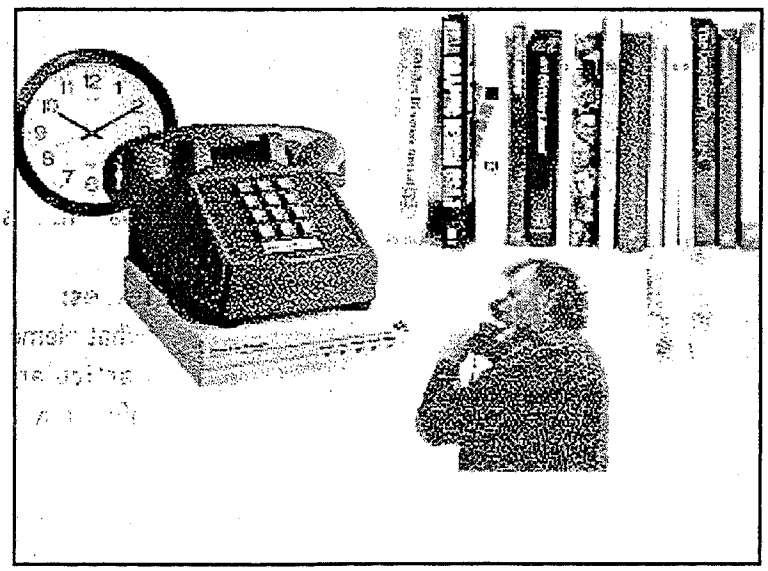
The Macintosh Desktop Interface was developed at a time when graphics were emerging as a primary element for interface designers. It inspired a whole new class of easy-to-use graphic interfaces. Recent years have added color, audio, and video. The opportunity is now is to create an interface which takes advantage of all these elements.

Desktop Drama was designed to try out some ideas in the multimedia environment of today. The experiment consisted of two parts: in the first, a short movie illustrated how a sensory-rich system might support collaborative work. Mocked-up on a literal tabletop rather an a computer desktop, this scenario illustrated how color cut-outs representing different ideas could be exchanged among participants. It also explored how these cut-outs might contain a range of details serving as placeholders for these concepts.



This mock-up of a collaboration scenario for group presentation illustrates how these representations might be used.

The second part of this experiment consisted of color cut-outs representing typical office tasks (eg: phone, address book, collaborator). We provided these to a different computer-users on their desktops. They found the simple presentation and movement of these library objects an engaging experience.



Graphical objects were furnished as clip art for individuals to use and arrange.

Issues:

What are the new interfaces designed to encourage collaboration in a media-rich environment?

How far will libraries of elements take users, and what provisions are needed for customizing graphical elements?

What can be learned in mocking-up user scenarios away from a computer?

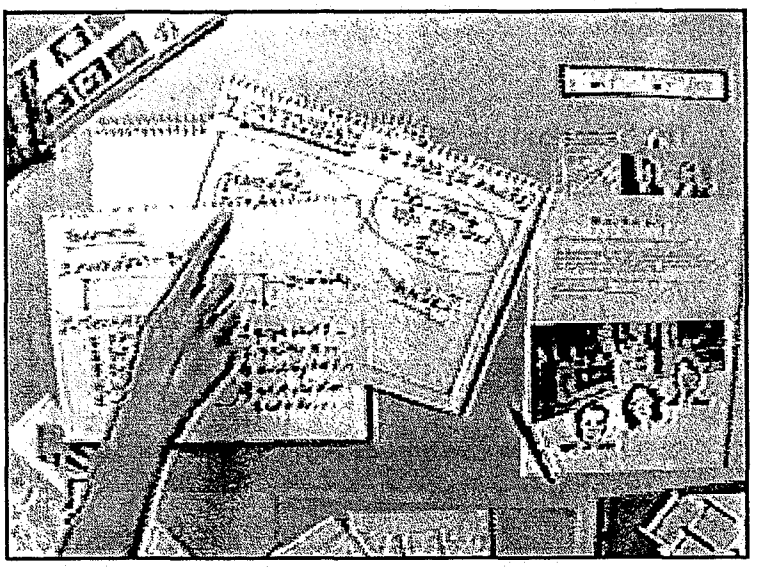
Observations:
Video is a good way to represent ideas quickly, a sort of "first step" toward knowing if they'll work.

By actually seeing a mock-up of this desktop, it became clear that some of its features would work and some wouldn't. Seeing it in any form is better than imagining it, especially with multidisciplinary teams involved.

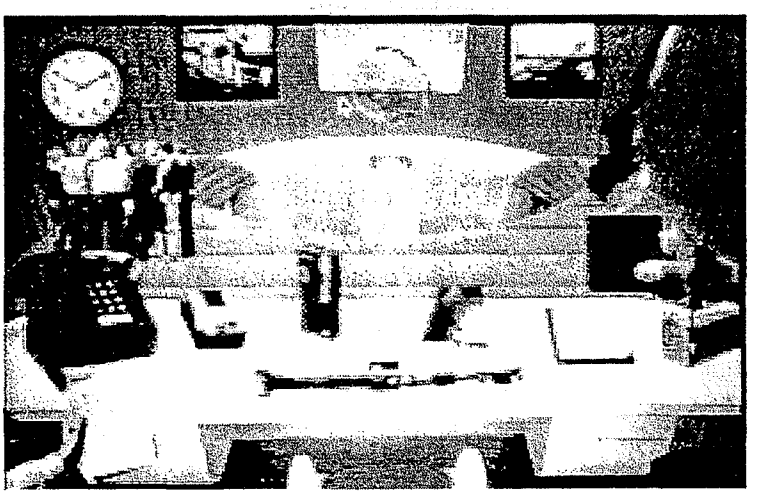
Simple clicking and dragging of objects proved excellent support for collaborative dialogs.

Sensory-rich elements provide a very different feel for a computer screen-based environment. It is tempting to use the elements to produce very literal surrogates for physical environments. Yet with experience, even the most literal representation can take on a very abstract meaning, as they serve as placeholders for developing ideas and future possibilities. They seem to work as readily-accessible launch pads for abstract considerations. They can also encourage artifact-based conversations among individuals, even in highly abstract domains.

Designers:
Steve Gano and Kristee Rosendahl



This use of a hand on the screen provides one model for conversations in a collaborative work environment, where participants may be in different physical locations.



Computer users can construct personalized workplaces on screen with the background and foreground elements provided by the system, or they can import their own.

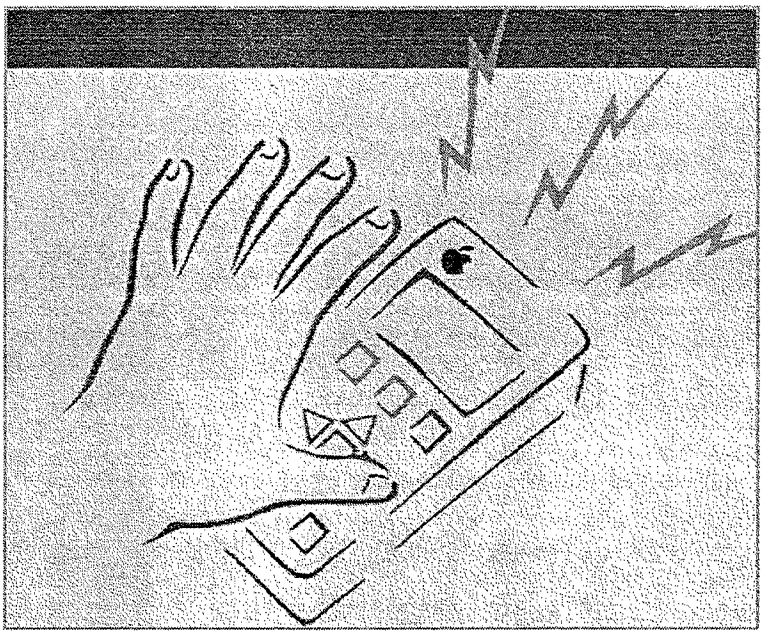
Small Device Feasibility Study

In Fall 1991, the Lab was asked to think of a range of small electronic devices that Apple Computer might consider for future products. In the spirit of bootstrapping our own technologies, we developed a "media object"-based system to address this assignment. Our intent was to further develop the elements and representations of multimedia objects, and to gain experience using tools which operate on them. This experience could then inform our future tool design.

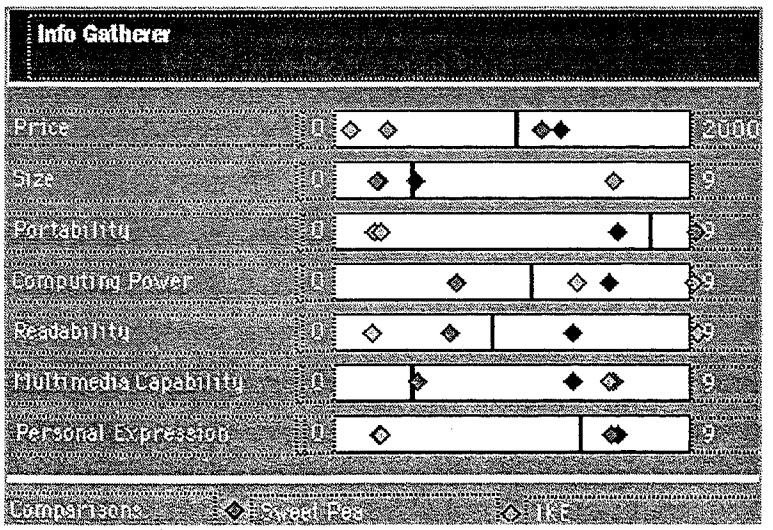
We began by generating short descriptions of small devices as they would be used in particular situations. These ranged from imaginary devices to those already well established as products. Imagined products were such things as the "Nile Navigator", a small device you could take along on a trip to get historical and other local information, while adding your own findings to its database. Or the Personal Information Server, which keeps track of your calendar, phone calls and other personal data. The Datacorder combines a camera with a data-gathering device designed to capture real-world experiences, complete with all the relevant data.

We also included product proposals that were being considered by other development groups. We took all these small device descriptions and turned each one into a multimedia object in the computer. Then we added objects representing newly-released products such as CDI and CDTV, as well as more familiar products like Nintendo, palm-sized TVs, and electronic address books. For comparison purposes, we added multimedia objects representing non-electronic things such as books and movies.

This project was the first time we created multimedia objects to help us think about current



Small devices connected by wireless communications systems can extend the everyday everwhere use of computing resources



We rated a number of existing and potential small devices on a range of attributes; these let us create a range of graphs for our analysis

industry issues. Each object included a text description, a picture of the device, a picture of someone using it, and other related video. The objects were also described by attributes such as size, cost, portability, educational and entertainment value. Attribute values between 0 and 9 were assigned using a slider on the screen. This also became our first pass at what we eventually called the Object Factory, where we created simple tools to enter a number of multimedia objects into the system quickly.

The multimedia objects in themselves were simply representations of small devices. By sorting the objects and placing groups of them into different "contexts" they could be displayed in relation to one another. One context was a "Grapher", in which the user could choose an attribute to label each axis of a graph, and then see the objects displayed in relation to those attributes. For example, price vs. multimedia capability offers an interesting graph.

A "Sorter" was another context in which groups of objects could be displayed in relation to one another. Attributes attached to a Venn diagram would place the objects appropriately. By sorting in many ways, a user could see patterns and relationships not previously considered.

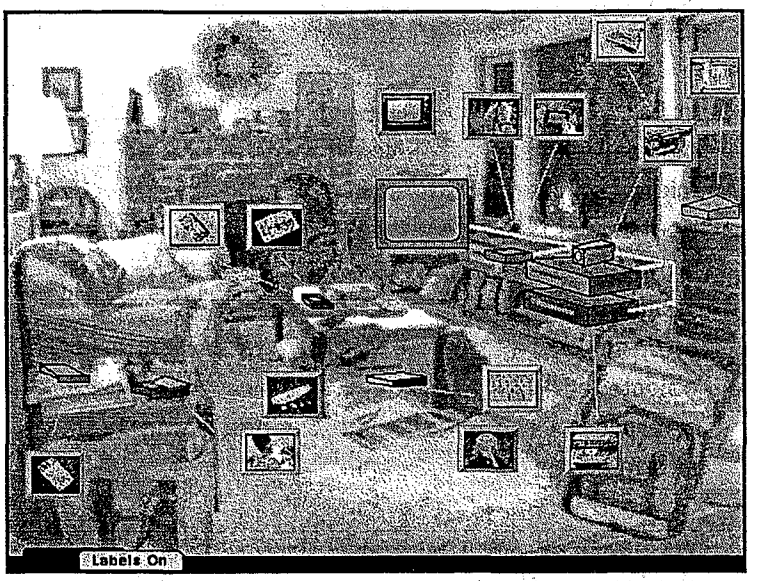
Issues:

What elements are critical to multimedia objects? In particular, what classes of video are most informative?

How might one design a system with both flexible attribute types and values where each can be changed in the course of a conversation?

What contexts are most useful for the purposes of display, comparison, and analysis.

What kind of on-line environments can support analytical thinking by groups?



We used a number of different backgrounds to encourage our imaginations in considering usage scenarios; here is one version of what your living room will look like in the future.

Observations:

We used these multimedia objects to engage in conversations with visitors, as well as for disussions amongst ourselves in terms of identifying relevant attributes and compelling contexts. Clumsy as our systems were, we got a glimpse of the potential of "pictorial conversations."

By graphing and sorting the objects in different ways, we were able to see vacant areas within the displays which suggested product opportunities.

Equipment Used:

Mac IIfx
SuperCard
Orange Micro Video Card
Panasonic write-once videodisc player

Designers:

Fabrice Florin, Steve Gano, Kristee Rosendahl, Charles Kerns, Kristina Woolsey, Margo Nanny

The Clipster

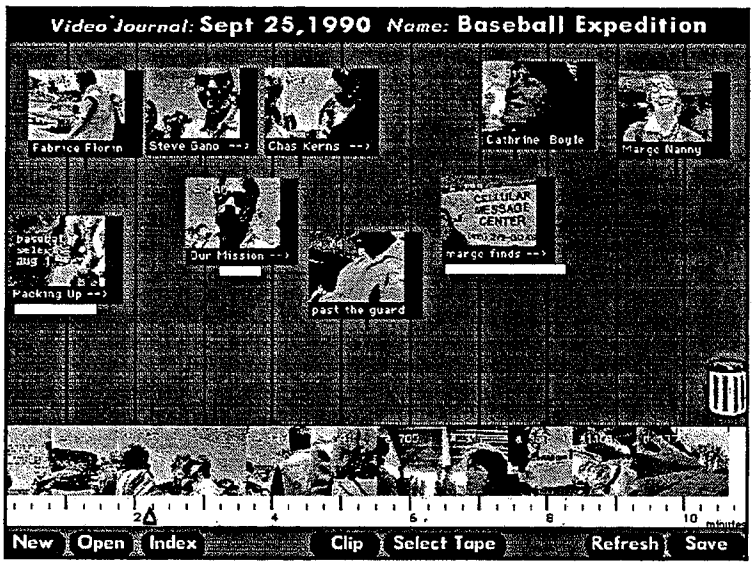
Description

Imagine a snapshot album for videotapes—one that simplifies access to your video library by graphically displaying the contents of a videotape, letting you add notes, and letting you create short clips to show or send to friends.

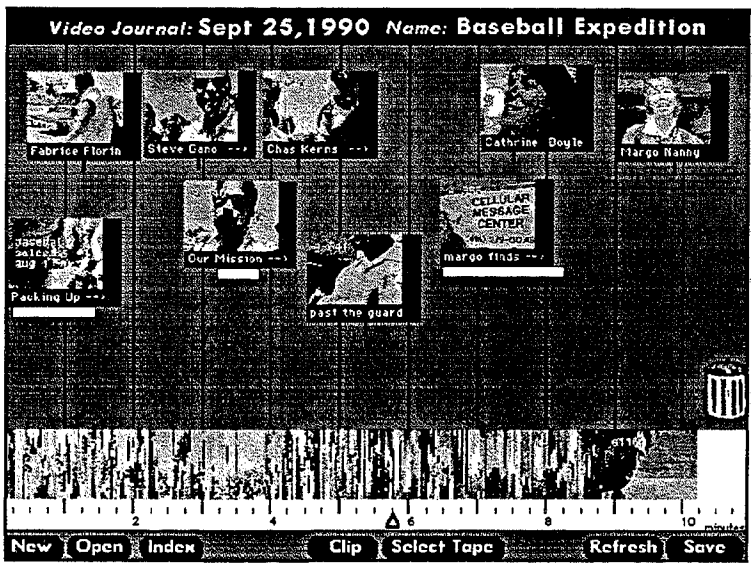
That's the idea behind Clipster.

Clipster is a prototype application for browsing long video recordings and making short clips. It digitizes a compact version of the complete video, controlling an 8mm camera or deck and grabbing one frame every second.

Clipster displays the sample frames along a timeline. You can make notes or specify clips in the screen space above the timeline. Clipster can transfer the video clips to a "select" tape or digitize a better quality copy of the clips. Clipster is written in HyperCard.



The timeline at the bottom of the screen shows sampled frames from a 10 minute videotape. Clips are represented above the timeline.



The timeline at the bottom of the screen has been changed to show a smaller portion of each frame, but a much larger number of frames are represented.

Issues

- How can the video library be moved out of the closet and into everyday use? How can people browse their video library, quickly locate moments of interest, and make clips?

- How can people avoid logging the contents of raw video footage, a time-consuming task that results in idiosyncratic shot lists of little value to anyone but, possibly, the logger?

- How can rich, temporal, visual data be graphically displayed for fast browsing and visual indexing?

Observations

- A graphic display showing a few sampled frames reveals much about a videotape, especially to those who recorded it or were present at the videotaping. It acts like a set of signposts—the viewer

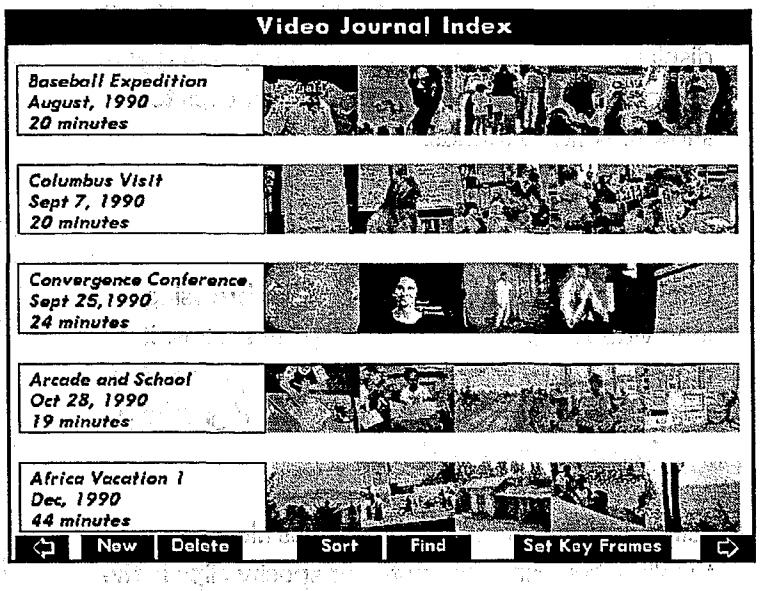
remembers what came before and after the frames shown. Conversely, a timeline with many sample frames, each containing only a little information, easily identifies the beginning and end of shots, camera movements, and special features (like color, temperature, close-ups, etc.)

• The combination of a video timeline and annotated clips depicts the contents of a videotape without having to do any traditional logging.

• Searching visual material is different than searching text. People can scan large numbers of images very quickly.

• Clipster is useful for making a graphic record of both raw video footage and film/video literature (movies, tv shows, ads).

• A multimedia recording device should support voice annotation, field marking of moments of interest, and technical data collection (such as focus distance) while image recording. Then Clipster, displaying this additional data along its timeline, will simplify the search process.



The screen lists the tapes saved in the video library.

Equipment Needed:

Color Macintosh, 8 Meg
System 6.07
Moonraker Video Digitizer Card
Control L Video Device

Designer: Charles Kerns

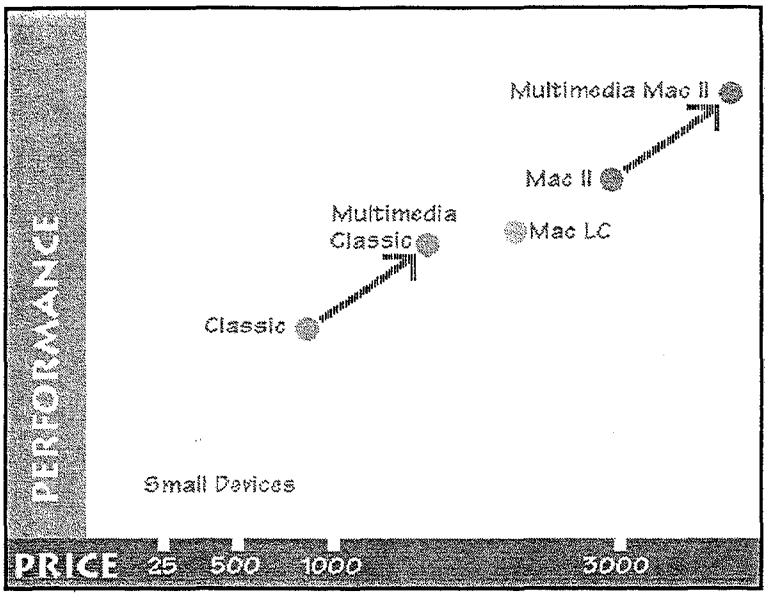
Project Production

A central task of any research organization is to describe its projects. This is often extremely difficult to accomplish for the Multimedia Lab because most of what we produce is highly visual, and idiosyncratic (eg. different equipment is used for each project).

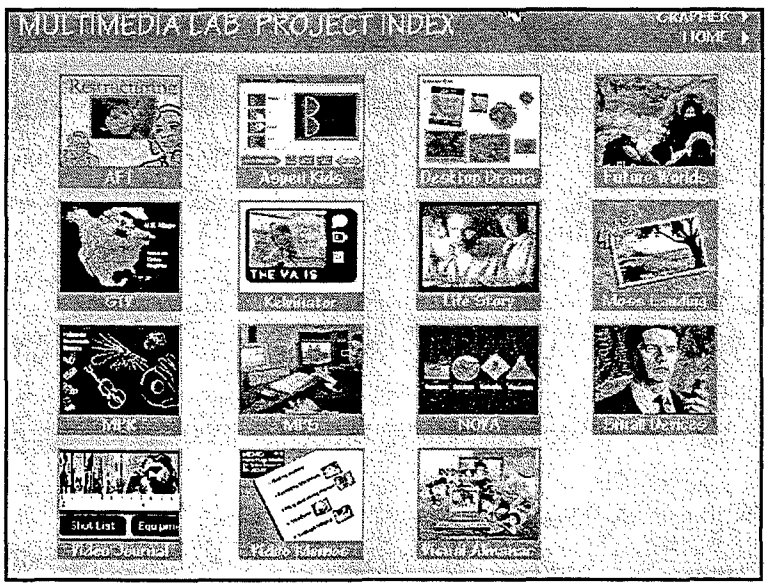
We chose this "project management" issue as a focus for our investigation of the usefulness of media objects. We explained how these objects might facilitate an ease of image use in "everyday life" (in the Lab). We wanted to build a broad-based toll which would assist in our frequent project demonstrations to visitors and would also allow more rapid access to visual materials for use in a conversational environment

We designed media objects representing recent projects and developed a software environment where they could be reviewed, analyzed and compared to one another. Each project was represented by a datacard which included descriptive text, an image, related movies and a series of attributes. Values were given for a range of these, including interactivity, date and size, using an attribute slider. A "Grapher" context enabled the user to put an attribute on each axis of a graph and watch as the software placed the projects in relation to one another. It elaborated on the grapher produced for the Aspen KIDS Project and the Small Device exercise, adding a crisper interface as well as a more flexible scheme for inputting and changing attribute values. The use of these tools led to interesting insights, unexpected new analyses and compelling conversations. The system provided us with a simple, consistent record of our projects and tools to see patterns that had not emerged in earlier analysis.

Issues:
What are the most useful elements of a media



In a general business presentation, we tried to connect our futuristic and suggested projects into the near-term strategic directions of Apple Computer.



The overview index provided a group or a single presenter with easy access to a diverse set of recent projects.

object? How can those elements be organized to fluently tell a range of stories about a project to different audiences? What short video segments are useful in explaining a project?

How do you represent projects that are basically visual in an electronic world, for general distribution and analysis?

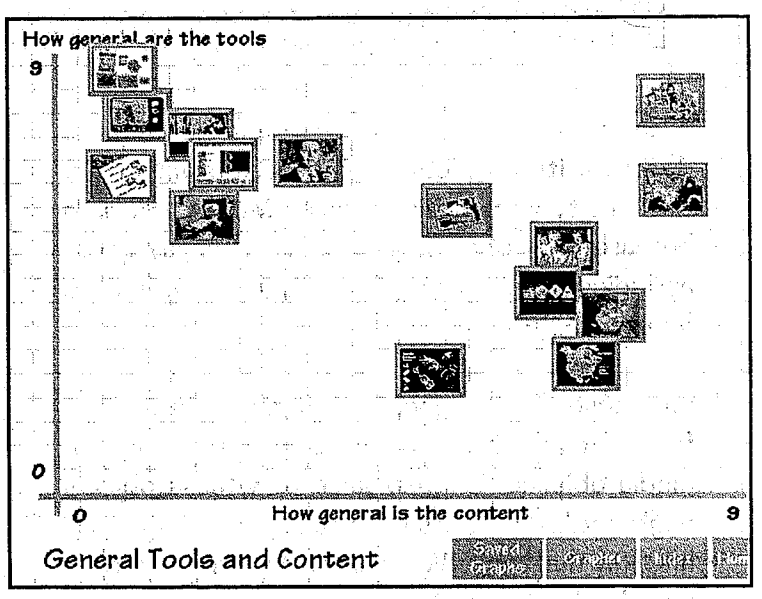
What attributes are most useful for discriminating and displaying research projects for future analysis?

How might one design a collaborative environment to set the values of projects on a range of attributes?

Observations:
Assigning values to attributes is highly subjective and often differs dramatically depending on who's entering the values. There was no absolute "truth" here. Rather we found that there was great usefulness in an attribute slider that could be changed easily, often becoming a negotiable point of discussion.

Our media objects, which included small video icons as placeholders, worked fine for an internal audience. However we found that it would take more well-developed objects, with more supporting information and video, to tell the stories to outside visitors. We did try adding a more general overview to this system for one important meeting, which helped in establishing a general framework for discussions.

This project could be viewed as a prototype of a project management system. The regular structure of objects allows for a consistent reporting technique, which could go across departments as well as within a research group. Remote pointing devices, including capabilities for multiple users, could greatly enhance the intersection engendered by such a system. Such a system would also be useful to describe summaries of very different materials that are fundamentally visual.



A general-purpose grapher allowed us to view and present subsets of our projects according to a wide set of attributes.

Equipment Used:
Macintosh II, System 6.0.7
SuperCard
Videodisc Player
Mass Micro Colorspace FX Video card

Designers:
Steve Gano, Peter Maresca, Kristee Rosendahl, Kristina Hooper Woolsey

Connections

Genre Exercises

Over the past year, we generated a variety of concept sketches exploring a new class of publication. The aim of our project, called "Genre Exercises," was to demonstrate appealing multimedia applications for in-home use that are neither encyclopedias nor video games.

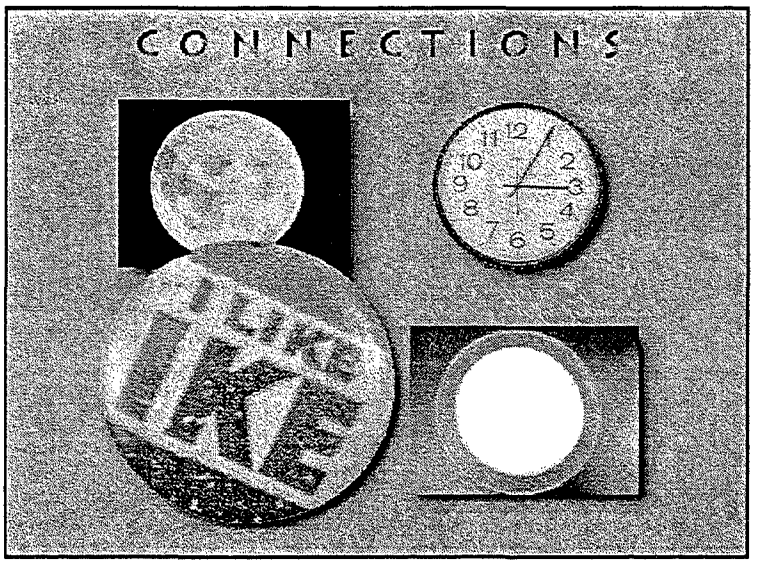
This project is at the intersection of issues developed in the Future Worlds project and in the Small Devices Feasibility studies. The aim was to create a broad sampling of "modular publications," to test and to refine our model of this new form of publication.

A modular publication has three elements. First, a set of multimedia compositions, to be viewed passively or interactively. Second, the set of all of the media objects used to create the compositions. And third, the tools and templates that allow users to take apart the sample compositions and create new compositions of their own.

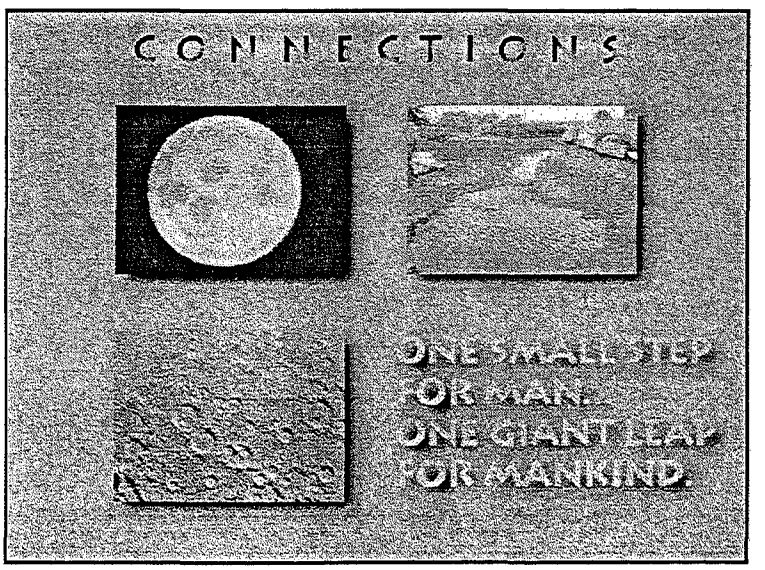
Description

In this example, we are presented with a display of four images. These four images have some visual element or elements in common. They might share the same color, or shape, or a particular theme. Clicking on an image brings up three additional objects associated in some way with the original image. For instance, clicking on the moon in the first card (where the connection is about round objects) reveals the moon, a close-up of the moon's surface, a quote from Neil Armstrong and a still from a video showing a tidal sequence. The connection at this level is shown to be the moon.

Each object also has an associated sound that plays when the image is selected. In addition, if the image is a still from an associated video clip, its video clip plays.



Here the connection is round objects. Clicking on the moon plays an associated sound and movie. Clicking on the moon again brings up three new associated images.



Here the connection is moon objects. If you click on the water picture, a movie of the tide rising and falling is played in accelerated time, implying a connection between the moon and the tides. Clicking on the tidal image again brings up three other objects connected in some way to this picture.

Clicking on the picture of the dolphins, for example, plays a movie and the sound of them jumping out of the water. A data card containing information about each image is also available and can be displayed when we option-click an object.

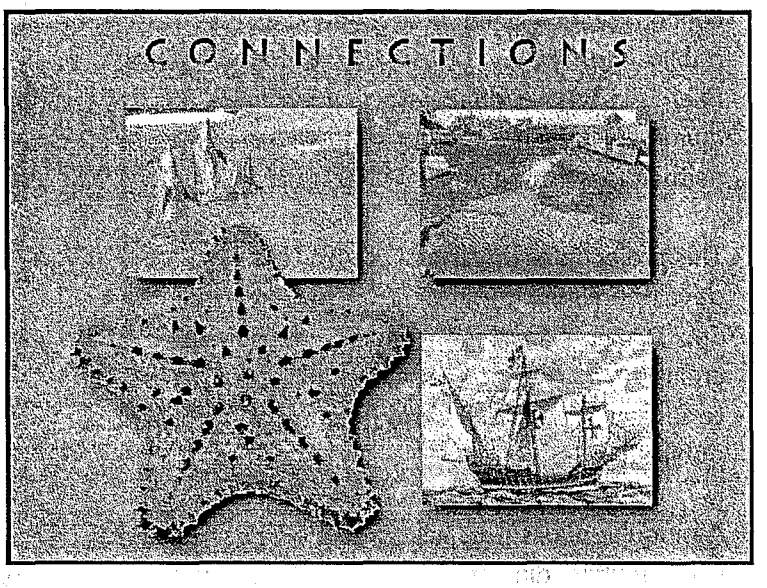
Design Approach

This design example was generated to let us browse pictures and movies based on their visual attributes like shape, size, color or theme. Through the game-like process of making connections between images, we learn new ways to look at pictures.

We wanted to create an engaging in-home visual awareness game for the whole family. Our display was designed to be seen on a television-like monitor, using a simple hand-held remote. The visual look of the design, layout and display were of particular importance in our research.

Connections is another example of using "media objects". Each image is a rich and complex object comprised of its images, sounds, movie clips and descriptive data. This paradigm lets us browse, examine and collect these objects for use in our own compositions.

An additional goal was to explore how the computer could add value beyond existing media. In Connections, the computer lets us explore a vast collection of images and information, comparing and contrasting them spontaneously—a flexibility and interactivity not available in other media.



The three images which appear after clicking the tidal picture reveal a connection about water. In addition, each of these objects has an associated data card, for further information.

Production and Tools

Our goal was to generate this example in a short period of time (1-2 weeks) and with the technologies at hand. Connections is a SuperCard stack with digitized sound and QuickTime movies. The images and sounds are from The Visual Almanac videodisc. The applications used were Supercard, PhotoShop, a MassMicro ColorSpace FX board to grab and digitize images, and MacRecorder.

Lead Designers:
Kristee Rosendahl, Steve Gano

Beads

Genre Exercises

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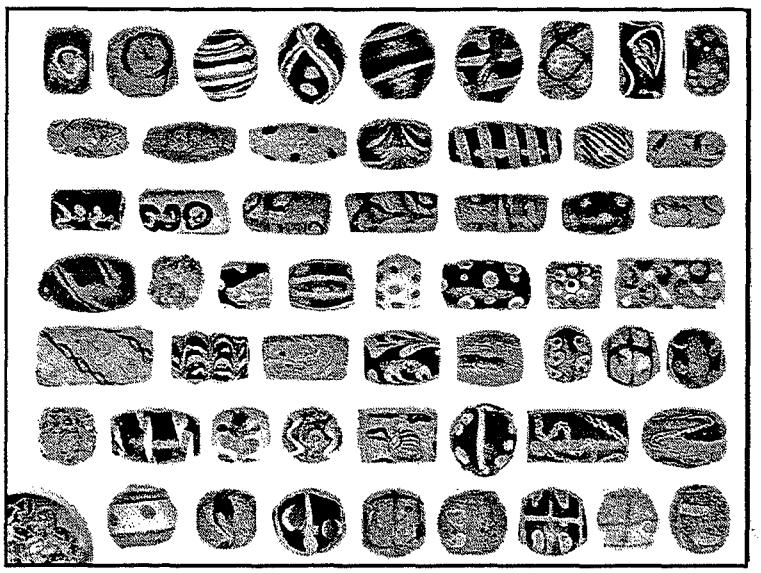
A modular publication has three elements. First, a set of multimedia compositions, to be viewed passively or interactively. Second, the set of all of the media objects used to create the compositions. And third, the tools and templates that allow users to take apart the sample compositions and create new compositions of their own.

Description

In this example, we developed a digital catalog of beads. Each bead is a "media object," which means we can select and examine a particular bead and access extensive information about it—details such as size, material, origin and history. As we find beads we like, we can "collect" them by dragging them into a bead bowl. This bowl is our personal container for anything we want to save along the way.

Once collected, the beads can be "strung" on the screen to create jewelry—necklaces, earrings, etc.—by dragging them out of the bead bowl and rearranging them into any configuration we desire.

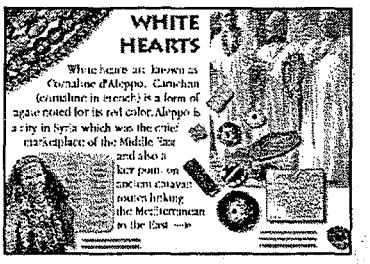
The computer also lets us construct beads out of materials that cannot exist, like water, mercury or



Bead bowl

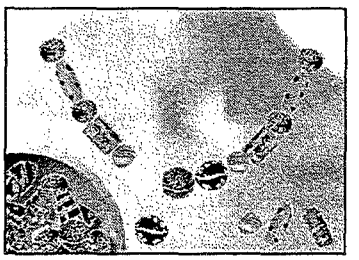
Browsing and Saving

You can browse this visual catalog containing thousands of beads from all over the world. Select one of the beads and save it in your bead bowl—your personal collection file of favorite beads.



Additional data

By clicking on a particular bead you can learn more about its background through datacards. The "History of beads" section contains pictures, maps, audio and film clips about where different beads came from, who made them and why.



Compositions

With your collection of beads, you can also make your own jewelry. Select beads from your bead bowl and "string" them along a path to make a necklace, or bracelet, or earrings. Or create entirely new beads out of old, new, or highly unusual materials.

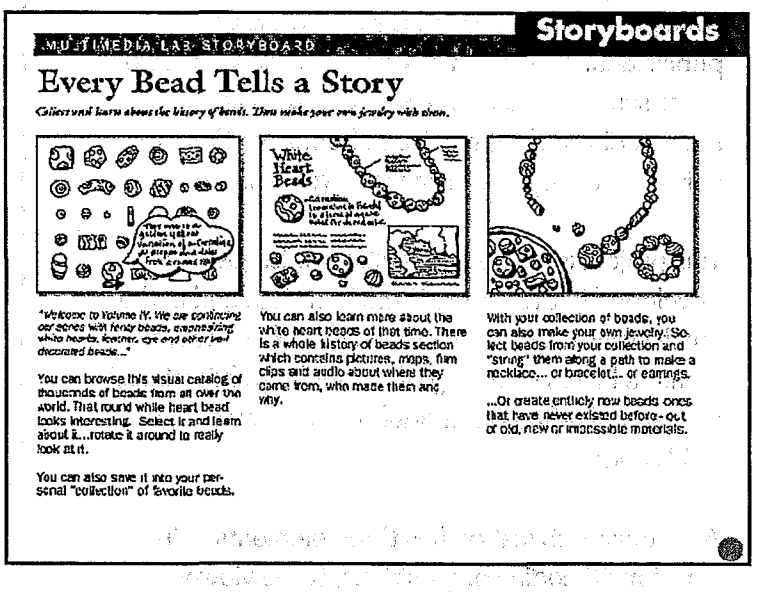
clouds. In this way, we can "own" or appropriate rare and expensive beads digitally.

We chose the subject of beads because they are rich and complex objects with great visual beauty. Each bead has a story to tell through its history and how it was made. Beads make good examples to help demonstrate notions about media objects.

An additional goal was to explore how the computer can add value beyond existing print media. Currently, we have access to beautiful books, magazines and catalogs of beads. Can the computer extend our experience of browsing a catalog by providing ways to retrieve, appropriate and create something new with the contents?

The Beads example also illustrates the larger class of catalog-type genres we want in our integrated digital environment. Browsing and collecting objects—beads, stamps, coins or whatever—gives us the ability to explore, acquire and arrange them in engaging ways not possible with other media. For instance, in future we might be able to order the necklace of beads we compose through an in-home, on-line, shopping network.

Beads is also a good example of the "scalability" of a modular publication. A publication can contain thousands of objects or just a few. We can choose and collect hundreds of objects or send a single one over the network to someone else.



First we generated a number of simple storyboards. These storyboards helped identify interface and depiction issues. Families using these on their televisions at home dictated the simplicity of the screen designs.

Production and Tools

Our goal was to generate this example in a short period of time (1-2 weeks) using the technologies at hand. The Beads example exists in the form of rough sketches, a storyboard and a SuperCard stack. We used mostly bead catalogs and books from own library. We invented no new tools. Our applications were Supercard, PhotoShop and a color scanner.

Lead Designers/Collaborators:
Steve Gano, Kristee Rosendahl

Advent Calendar

Genre Exercises

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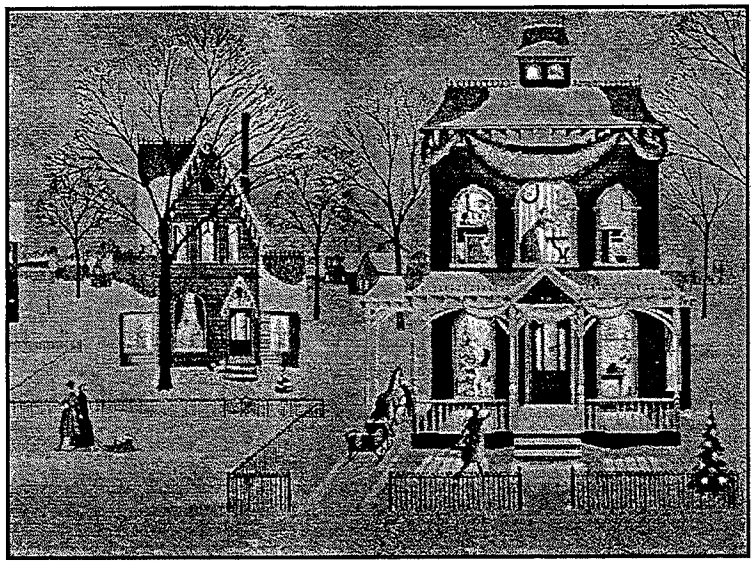
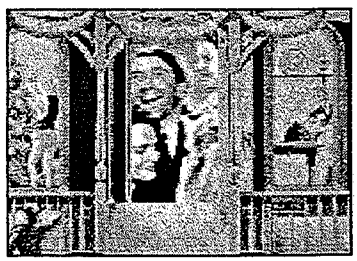


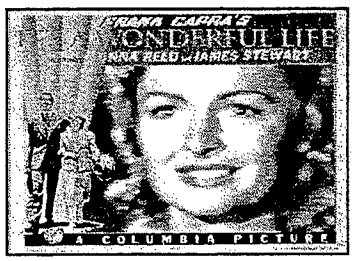
Opening Scene. As with printed Advent Calendars, the user has 24 doors and/or windows to "open", revealing short video clips frrom favorite Christmas movies.

Description

The Advent Calendar opens to a nostalgic illustrated scene of Christmastime. Outside, snow falls gently on a small-town neighborhood. In the windows we can see families preparing for the holiday, and seasonal music plays in the background. When we click on the front door to one of the houses, it creaks open, and through the window we see a familiar face: Jimmy Stewart in the final scene of a favorite Christmas movie, "It's A Wonderful Life".



Clicking on the front door opens it to reveal a video clip of "It's a Wonderful Life".



A lobby card provides access to additional images and information about the movie.

As we view the scene where "the angel gets its wings", we can click again on the image, and view a data card about the movie. In this case, it is a "lobby" card which shows us key still images while playing the movie's musical overture. On the lobby card, we have access to all of the information about

the film: cast, director, crew, synopsis, and much more.

Design Approach

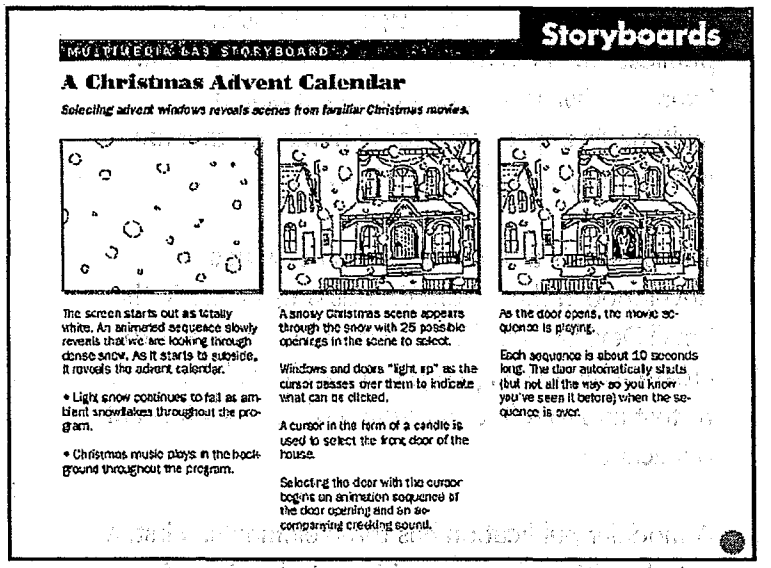
The Advent Calendar was motivated by a desire to demonstrate instances where very small movies are a delightful feature, rather than a deficiency of the current state of software video decompression.

The small movies in the Advent Calendar are a "movie capsule" type of media object. The Advent Calendar is one kind of composition, or context, for displaying a group of movie objects. Another kind of context might be a thematic movie browser in a video rental store. An on-line television schedule might contain movie objects as previews of coming broadcast attractions.

The data contained in a movie object would include all of the information one would expect to find in an authoritative reference on movies. Certainly all of the information in the credit roll is there: cast, production crew, copyright and technical information. Other data about the movie is also available: box-office receipts, release date, awards, etc. And of course, all of this data is searchable, i.e., "Find me every Academy Award-winning movie that lost money in the 1970s".

The objects may also contain a range of audio/visual portrayals of the movie. In the advent calendar, a small clip from the movie, a set of stills displayed in a lobby card, and the musical overture are three such portrayals. Others might include a trailer, behind-the-scenes stills, storyboards, costume designs. Not every context will use all of these portrayals, nor would it be economically feasible to include them all in every publication. Yet each movie object has the potential of having any or all of these portrayals.

The Advent Calendar context itself might be emptied of its Hollywood movies, filled with home movies of the family, and sent to friends as a Christmas greeting.



Generating storyboards helped define issues of interface, navigation, and user experience.

Production and Tools

The Advent Calendar was produced before QuickTime was available, and has not yet been converted to digital compressed video. The video source is a Panasonic optical disc recorder, and a MassMicro ColorSpace FX card is used to combine the video and Macintosh graphics. The illustration is a magazine cover scanned in with a Sharp color scanner, touched up in PhotoShop, and imported into SuperCard.

Designers/Collaborators:

101 Activities

Genre Exercises

Over the past year, we generated a variety of concept sketches exploring a new class of publication. The aim of our project, called "Genre Exercises," was to demonstrate appealing multimedia applications for in-home use that are neither encyclopedias nor video games.

This project is at the intersection of issues developed in the Future Worlds project and in the Small Devices Feasibility studies. Our aim was to create a broad sampling of "modular publications," to test and refine our model of this new form of publication.

A modular publication has three elements. First, a set of multimedia compositions, to be viewed passively or interactively. Second, the set of all of the media objects used to create the compositions. And third, the tools and templates that allow users to take apart the sample compositions and create new compositions of their own.

The cover screen is constantly alive with ambient sound and graphics, letting me know it is always available and ready for me to use.

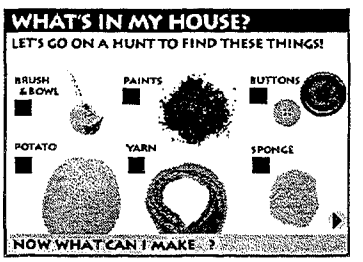
Description

This example demonstrates an interactive activity book for kids. 101 Activities lists everyday items I may have in my house, and then tells me what I can make with these supplies.

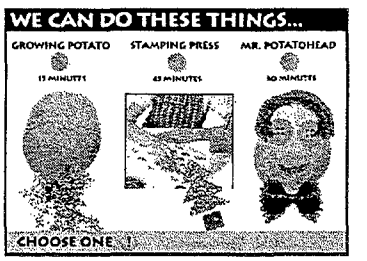
First, I go on a "treasure hunt" to find as many of the materials in the inventory as I can. Then I check each one off on the picture inventory on the TV screen.

When I click the "What can I do?" button, the computer shows a list of craft activities that I have the materials to do. Each one tells how long it takes, and how messy it gets.

Once I pick an activity, I receive step-by-step information on how to accomplish it. Still pictures



The visual inventory is where I check off the items I have in the house. As opposed to the printed book, the computer can then customize and suggest activities best suited for me.



Given the materials I have in the house, there are three activities suggested. I can grow a potato, do potato printing or make a potato head.

show what the object looks like at each stage. Short movies illustrate how to do certain tricky things, like tying knots or how much glue to apply.

Design Approach

We chose to use *My First Activity Book* by Angela Wilkes as the foundation for our design example. It is one in a series of books for children on topics ranging from nature to cooking. They all feature imaginative layouts and large, beautiful photographs of the objects at actual size. There is a high utilization of step-by-step procedures for making your own activities.

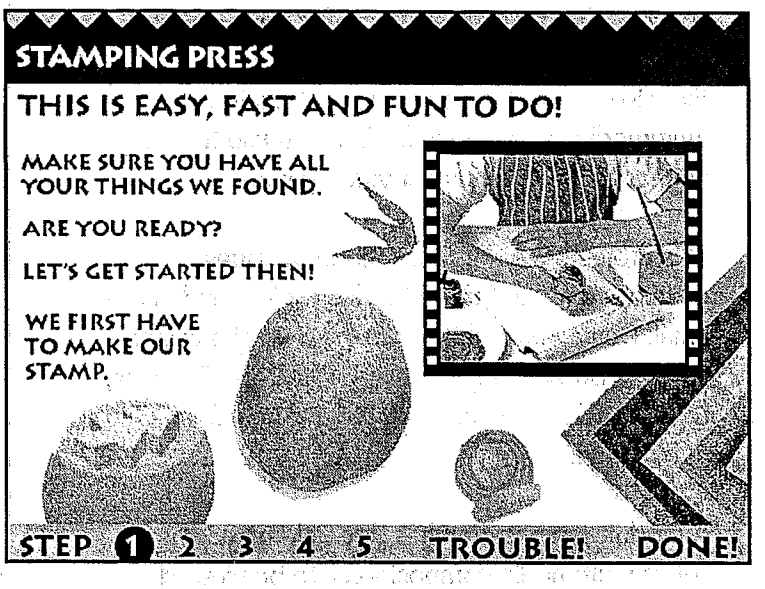
Our aim was to explore how the computer could add value beyond these wonderful books. We felt we could extend the books' usefulness and playfulness through the addition of sound, movies and voiceover.

One way was to provide a dynamic, fluid and ambient sound environment which would both guide and engage the kids in their activities. The system always feels alive, "on" and available to use. Each step has its own score, and the "trouble-shooting" section plays a more somber, serious ditty.

We also created a visual inventory which lets kids customize their activities according to what they have in the house at the time. The system becomes a "smart suggester" about possible things to do. Printed media cannot really provide this kind of flexible, responsive approach.

This idea could also be extended to use for meal planning. I could tell the computer what ingredients are in my house, and it would suggest possible menus made from these foods.

The use of QuickTime movies makes these, and other, applications feasible extensions of traditional "how-to" types of publications.



The system provides me with various ways to follow each steps. There may be text on the screen to read, a small movie clip to watch, and/or a voiceover to tell me what to do.

Production and Tools

Our goal was to generate this example in a short period of time (1-2 weeks) using the technologies at hand. The 101 Activities example exists in the form of rough sketches, a storyboard and a SuperCard stack. We used Angela Wilkes' *My First Activity Book* as source material. We invented no new tools. Our applications were Supercard, PhotoShop, MacroMind Director, Audiomedia card and a color scanner. We hired a contractor to help design and construct the stack.

Lead Designers/Collaborators:
Steve Gano, Kristee Rosendahl, Darrell Sano

Beyond the Desktop:
A Visual Almanac Extension

Description

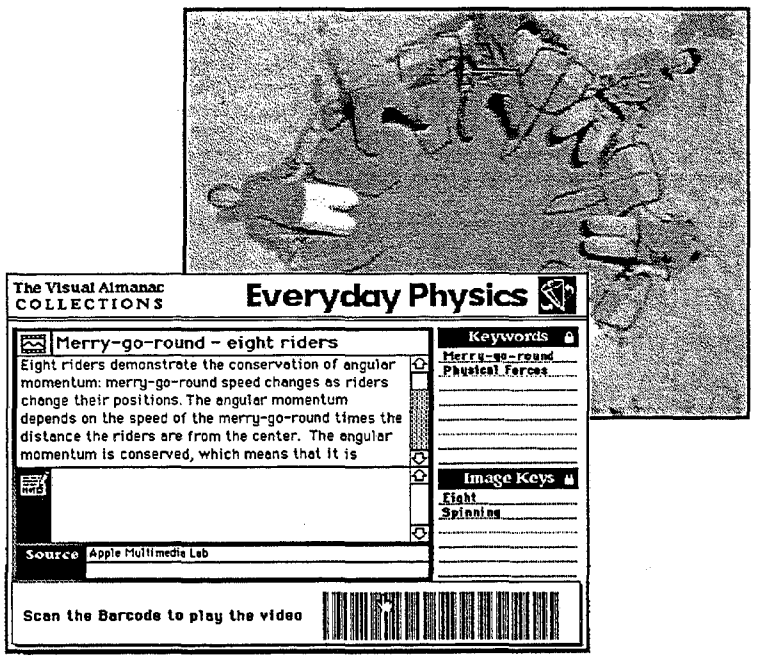
The Visual Almanac was a rich, complex product containing a wealth of imagery and information. However, as with other wonderful computer products, its interface remained "inside the box." There was no way to "take it with you." We considered this a great disadvantage, as the world is filled with a wealth of objects and information beyond the desktop. Our project involved experiments using barcodes to connect real-world objects with the store of images and information in the Visual Almanac.

"Baseball Cards"

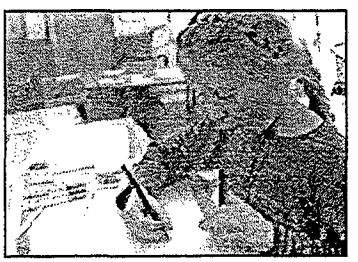
Picture cards were created for objects in The Visual Almanac. Similar to baseball cards, each of them had a picture on one side and data and a barcode on the other. The cards gave students a way to carry physical representations of on-screen objects or material found in the computer. For example, the "Angular Momentum" card—representing a merry-go-round video sequence in the Visual Almanac—could be pulled out of a student's pocket and talked about on the school playground. Later, the card's barcode could be used to access the "Playground Physics" sequence in the Visual Almanac.

Storybooks

First grade students wrote stories and drew pictures about animals. Each story had a barcode to access an animal videoclip from the Visual Almanac videodisc. The teacher created a book of the stories and the children learned to read by reading each others' stories and watching related clips. An extension of this idea was barcoding a commercial animal book, so that it could also be linked to relevant images on the video.



Front and back view of a Baseball Card. These acted as transportable representations of material contained in the Visual Almanac.



Barcodes enabled first graders to connect their own stories to Visual Almanac animal pictures.

Connecting Objects

Objects were also barcoded. For example, a student could pick up a milk carton, scan its barcode, and access images telling the story of milk—where it comes from, how it's made, etc. The student would focus on the object of interest, milk, rather than the technology used to present the information. In preparation for a field trip to tidal pools, the classroom's dried starfish acquired a barcode, connecting it to the Visual Almanac's timelapse video of starfish feeding. One can imagine many objects in a learning environment which would benefit from being connected to images and data at a multimedia computer station.

Barcoded milk carton was a good example of connecting a real-world object to images and data in the computer system.

Issues

• The information in computing environments is generally detached from the real-world objects surrounding us.

• A truly fluid experience will require more than barcodes. They are distracting and unattractive. The barcode readers are cumbersome.

Observations

When objects in the environment become part of the computer interface, we gain:

• concreteness
• ownership of information
• a more intuitive and natural experience
• a content-driven experience rather than a technology-driven one

Equipment Needed:

Mac Plus with 40 meg hard disk, Pioneer 4200 Videodisc Player and Pioneer bar code reader

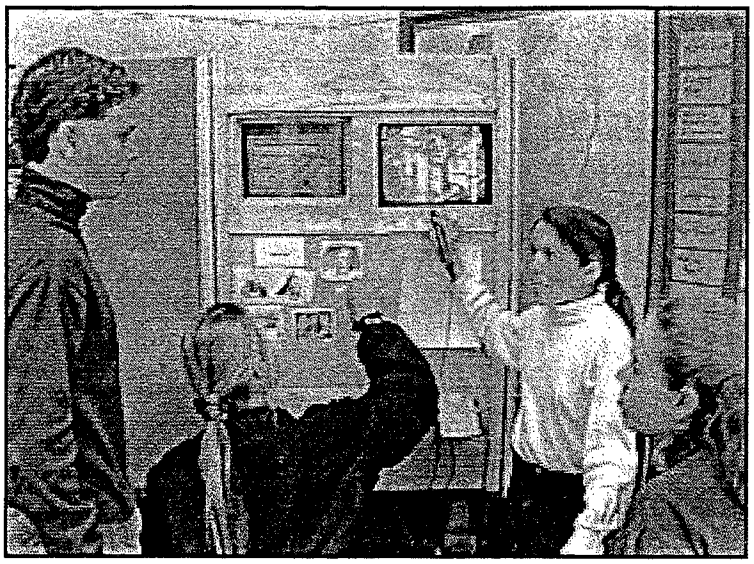
Designers/Collaborators: Margo Nanny, Bob Mohl and Charles Kerns

Classroom Multimedia Kiosk

Description

A cross between a kiosk and a school bulletin board, this multimedia information posting and display system was installed in a seventh grade Social Sciences class for two months.

At the kiosk, students used *"Geography Television" (GTV)*, a videodisc-based multimedia program, to study U.S. history. When they found interesting images or video segments, they could halt the video and make a History Card—a small, printed card showing the video image, the student's title for the image, and a barcode label. When the label was scanned with the kiosk's barcode wand, the History Card's video segment played. Printed History Cards were used to make timelines (mounted on the kiosk's sides) and to illustrate student newspapers.



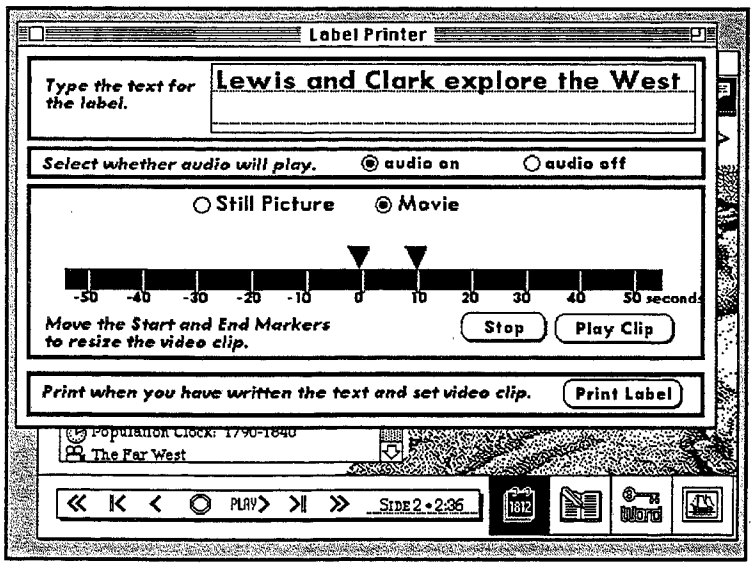
Students using the Multimedia Kiosk to make History Cards. One girl is scanning a barcode label posted on the kiosk to replay a video segment.

Issues

- How can the computer be involved in a wide range of classroom activities, rather than remain isolated at the desktop computer station?

- How can a small number of multimedia computers be used collaboratively in the classroom?

- What graphic constructions, like timelines and semantic webs, are useful as collaborative compositions?



Students specify a video clip and title it in this Mac window. Then they make a History card by printing a label and picture.

Observations

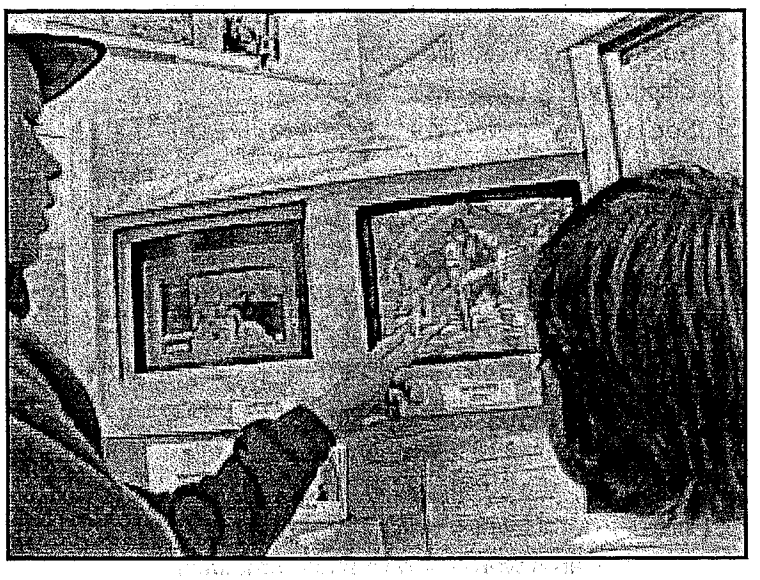
- Adding a search task to a video viewing situation—in this case searching for images to save on History Cards—changed the students' viewing behavior from passive observation to active, goal-directed searching.

- The multimedia kiosk became a social center of the classroom, one where history was discussed and students shared their knowledge.

• Students reindexed the videodisc by posting History Cards on the kiosk. Students ended up using this homemade index of History Cards to locate a video segment, instead of using GTV's search software.

• In designing the timeline, students manipulated the History Cards, sorting and sequencing them to identify important events of the period. The History Cards were used as tokens when the group negotiated the contents of the timeline.

• The timeline was a collaboratively constructed graphic composition. Preparing other types of graphic compositions, such as dependency charts or maps, would allow the learners to further releate the individual historical events. Making History Cards is a first step in the construction of more complex compositions.



Two students use the GTV program. The Mac screen displays information and instructions; the other screen shows the video. History cards with barcoded instructions are posted just below the screens.

Equipment:

Macintosh Computer, System 6.07,
Videodisc Player, NTSC Monitor,
Mitsubishi Video Printer,
and CoStar Label Printer

Designer:

Charles Kerns

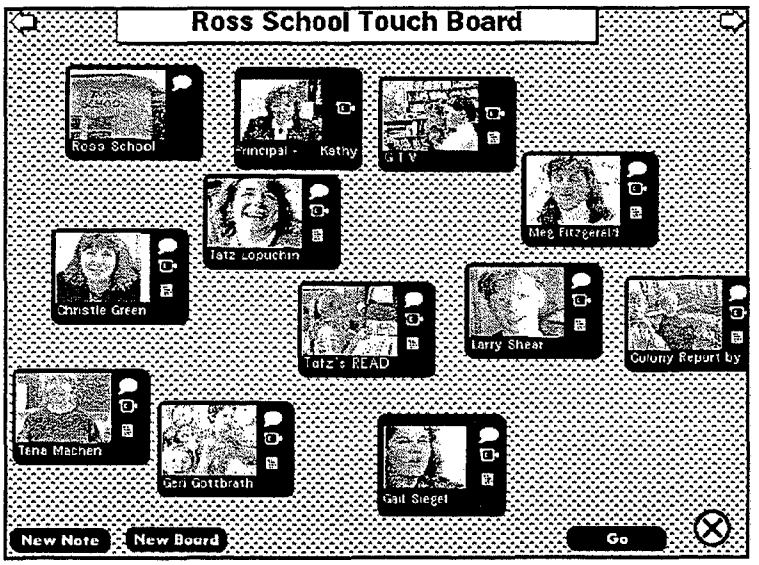
Ross Bulletin Board

Description

The Ross Bulletin Board was installed in a hallway at the Multimedia Lab. Lab members used it to post multimedia notes describing their activities at a local school.

Modeled on the everyday use of refrigerator doors to post notes and photos, this computerized bulletin board displayed notes made from an assortment of media—video, voice, text, still images, and a horizontally scrolling, "marquee" title.

The bulletin board had a multi-page display space in which notes were posted, and a note-maker for authoring. Each note showed a titled still image. Icons indicated whether video, voice, or text had been added to the note.



Multimedia messages about Ross School are posted on the bulletin board.

Issues

• What combinations of media make a basic, yet interesting and informative message?

• How will a small work group use the video capabilities of the bulletin board for intra-group communication?

Observations

• A typical message included a video segment that showed an action or a person, a voice note that explained the video, and a short title. The note had a descriptive video layer and an interpretive voice layer.

• When text was entered it was often redundant, restating the voice note.

• Time is of the essence in a bulletin board system. Video not processed immediately was usually superseded by new recordings. A video bulletin board requires a simple, quick video clipping

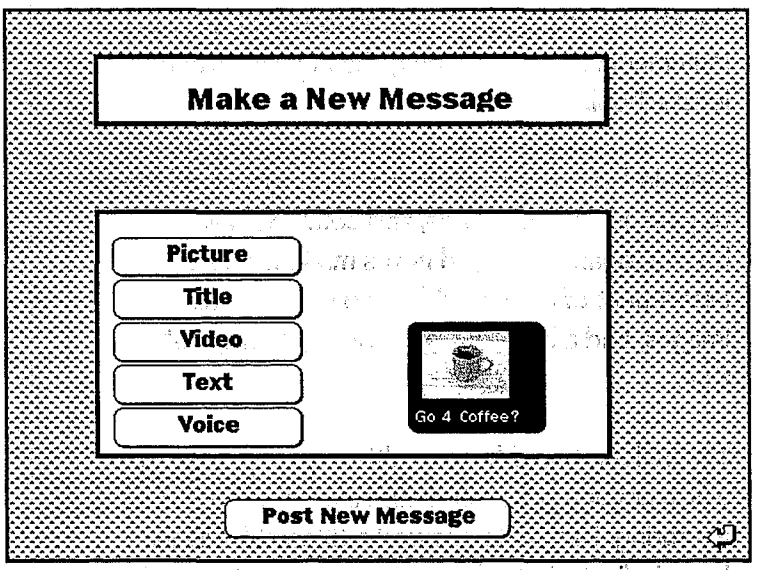
This message about one of the teachers includes a voice recording, video clip, and text.

system that encourages immediate posting of notes.

• The bulletin board was in a public area passed constantly by lab members, so they could browse it without any special effort. It was frequently used as a place to bring others for discussions about specific notes. Location seems key for high usage.

• The bulletin board's relatively flat structure made it easy to view all of the notes present. There were requests, however, for a more complex structure to graphically interrelate several notes.

• The number of notes written during the test (about 50) was easily browsable. In an ongoing system, a method for removing old notes needs to be added.

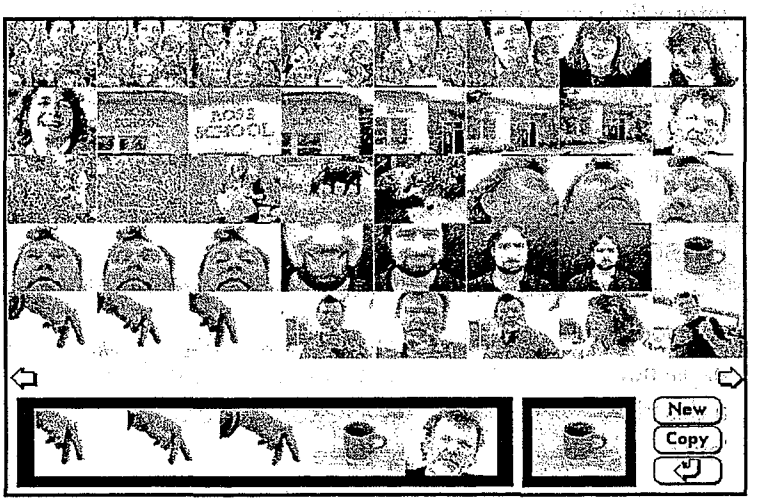


The note-maker for authoring multimedia notes.

Equipment Needed:

Mac II or better, 8 Meg
System 6.07
Colorspace Video Digitizer
(optional) OMDR videodisc recorder

Designer: Charles Kerns



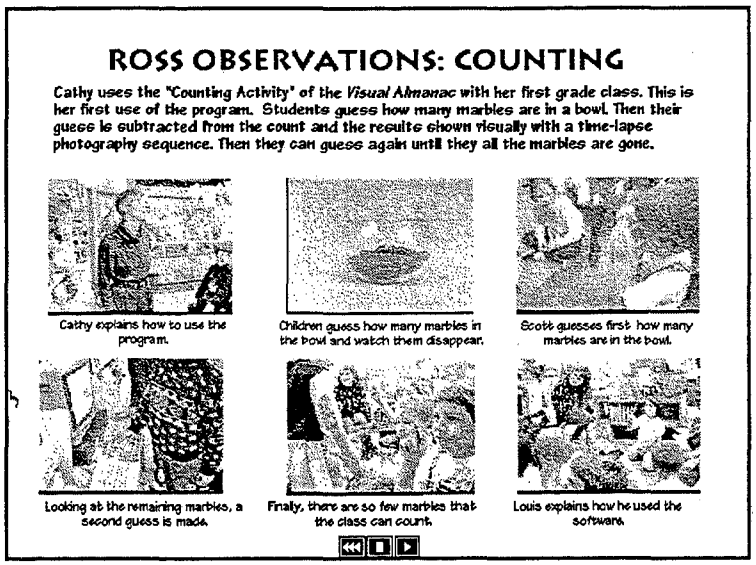
Choosing an animated sequence of still images for a message asking to go out for coffee.

Ross Report

Description

During Spring 1991, Lab members were engaged in experiments and observations at Ross School. This multimedia summary report documents those activities.

The report is constructed from media objects representing the activities at the school. Such media objects are displayed in *contexts* that allow analysis and reporting of the school activities. For example, a *grapher context* (such as the one shown below) plots the media objects according to their scalar attribute values. A *sorter context* is used to categorize the media objects.



This context is used to describe one experiment in detail. A video clip is played when an image is selected.

Issues

• What processes for recording video and stills provide adequate coverage of the events at the site? Are professional videographic techniques required?

• Can casual multimedia recording (recording video and stills while engaged in other tasks like teaching, negotiating, or observing) provide an adequate summary of the activities?

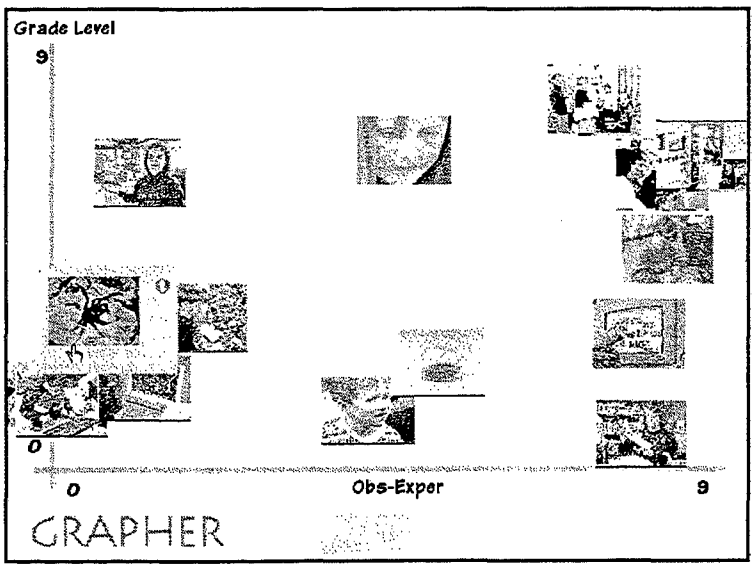
• Is the media object model adequate to represent a research project in a summary report?

• How can one integrate narrative or interpretive elements into the media object-based report?

Observations

• The media object model is useful for creating an interactive report. It describes the experiments and observations made, but also allows the end-user to examine relationships between these activities by using the graphing and analysis contexts.

• There are several narrative presentations within the report composed of media objects. This makes



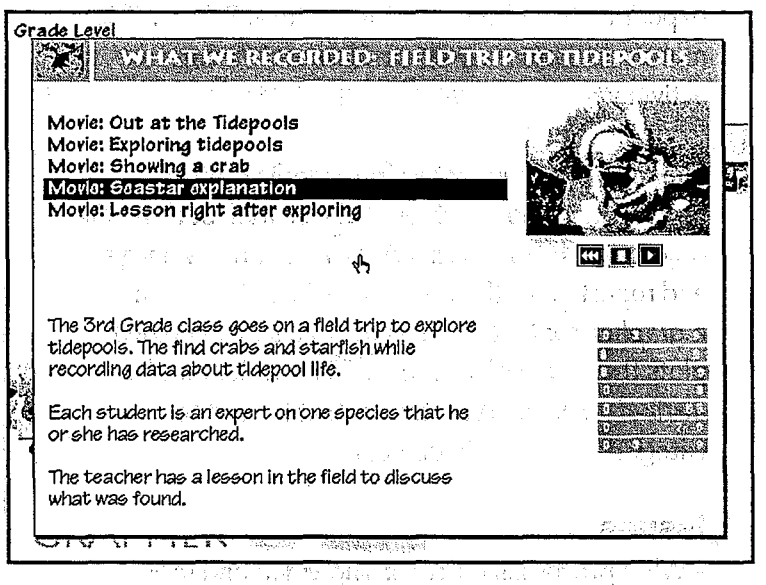
The Grapher Context plots different activities at Ross School. Each image on the graph depicts a media object, plotted according to its Grade Level and the degree of intervention by lab staff (Obs/Exper).

the presentations "deconstructable." The end-user has full access to all data for any media object.

• Casual video recording by non-professional camera-people at the school site produced adequate footage to document the lab's activities. We developed techniques for using independent, unedited video clips in a storyboard-like, graphic display that did not require the typical establishing shots and cut aways used in movies. The end result of the video recordings was not a movie, but a mutimedia composition

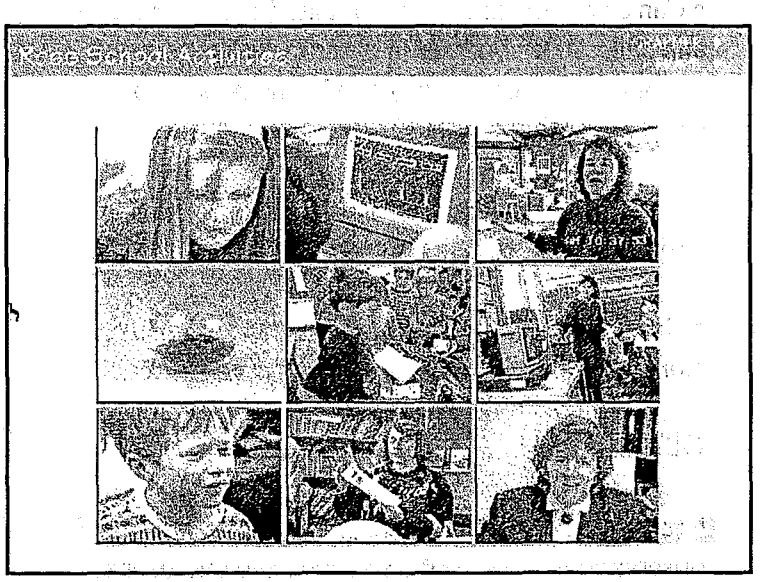
Equipment Needed:

Color Macintosh, 8 Meg,
System 6.07
Raster Ops STV Video Digitizing Card



The Data Card Context displays attributes for a Media Object representing a school field trip. Video clips, a text description, and several scalar attributes are shown.

Designers/Collaborators:
Charles Kerns, Catherine Boyle and Margo Nanny



This context is used for making live presentations. Selecting one of the images reveals its Data Card.

Collaboration Scenario

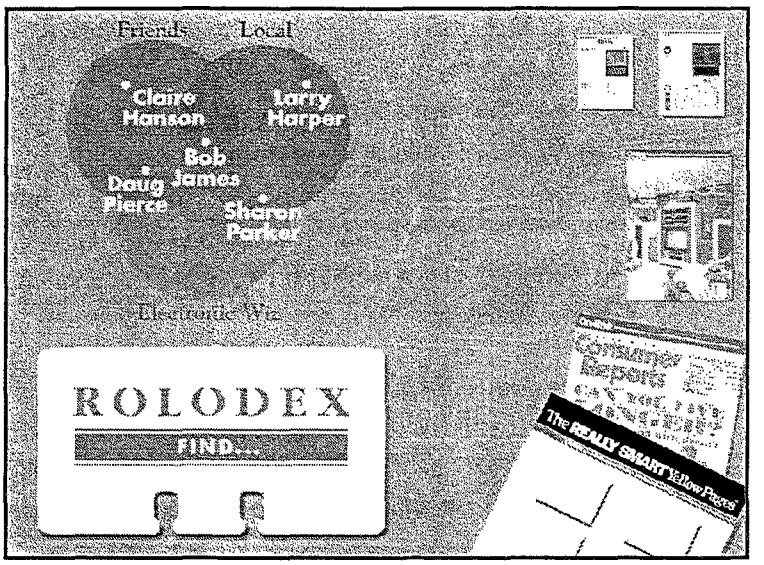
Description

Imagine shopping for major purchases where the product research tools of today (magazine reviews, Consumer Reports, product brochures, etc.) are available electronically. The information contained in these tools is stored in a standard format, allowing it to be appropriated and/or merged with that of other sources. These information sources have no "publication date"; they are always current and available over a public communication network. Each store has its inventory available electronically. Not only are video phones prevalent, but there are also systems that allow the incorporation of other real-time data streams beyond just the voice and picture of the caller.

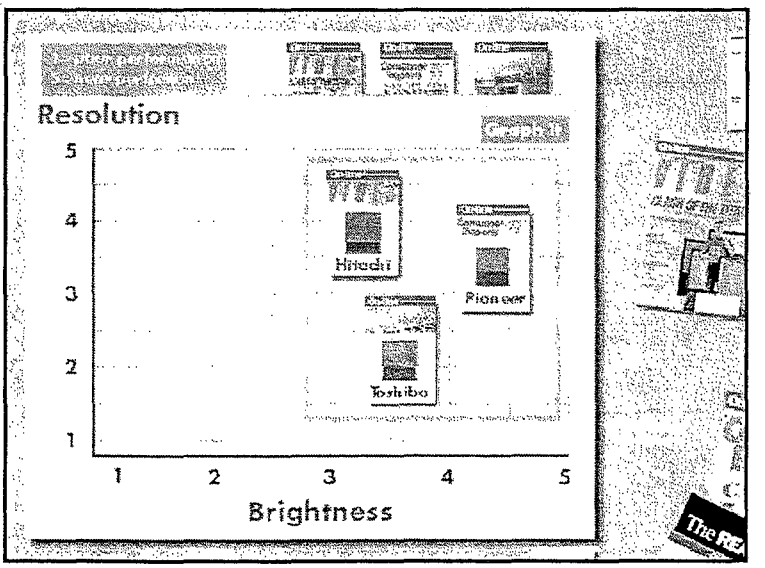
The Collaboration Scenario is a stake in the ground to help define the capabilities of networked multimedia environments in a world with these sorts of resources. It is a design example of a system that would allow real-time use of distributed multimedia information to accomplish everyday personal tasks. In this scenario, a person who wants a new television consults with electronic magazines, a friend who is an expert in such matters, and the Really Smart Yellow Pages™ to help narrow the choices. The end result of this at-home search is a list of two or three televisions and the names, addresses, and operating hours of stores that carry them.

Tools

- Database searches local to the user, local to the expert, and over-the-network to published sources of information.
- Graphing tools
- Sorting tools
- Smart graphics, (for example, images from a public source will be scaled to fit when placed within a captured image of the user's living room.)
- Real-time capturing and sharing of visual and auditory information.



I want to discuss purchasing a television with a friend and electronics expert. I bring up a sorting tool from my Rolodex and enter in "Friends", "Local" and "Electronics Wiz". The Venn -like diagram shows me that Bob James is the person I should talk to.



After selecting three magazines to be graphed, I draw out the area of the graph that most interests me. When I choose "Graph it" three televisions appear to fit the criteria according to their magazine source.

Design Issues

The Collaboration Scenario brings up several issues for the use of multimedia in a networked environment.

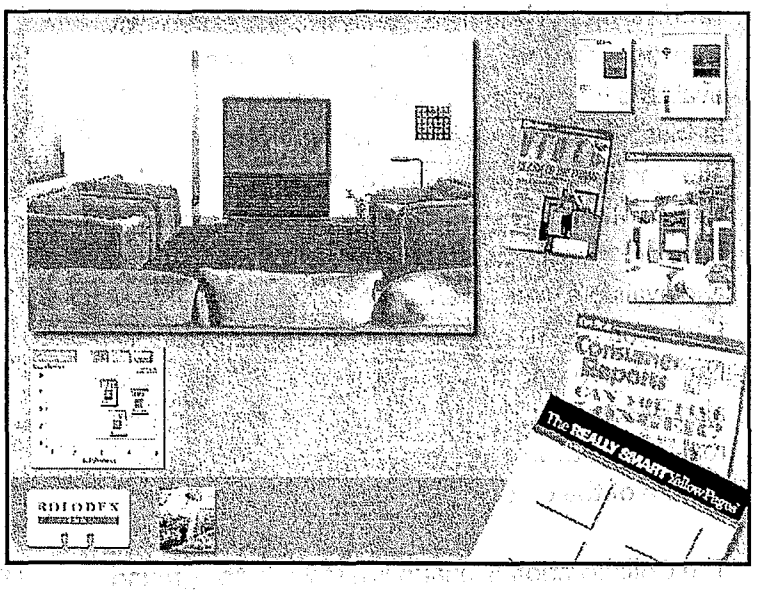
• What is the new form of on-line magazine or catalog? How is its information marked to reflect that its source? How is it kept up to date?

• How will users make and display public and private screen space? How is information moved easily between these spaces?

• Many parts of our daily lives have personal data associated with them that are not available in electronic form. Tools to allow the easy creation of this electronic personal information database are called for.

• How are our collaborators, colleagues and ourselves portrayed in these spaces? When is just voice appropriate and what are the occasions we need voice and video?

• How do we capture a picture or piece of information about our environment casually, in real-time and display it on the screen?How do we annotate it?



I drag one of the televisions from the grapher into a picture of my living room. The television rescales itself to the appropriate dimensions so that I can see how it will really look in my particular space.

Production

The Collaboration Scenario was generated using PhotoShop, a Sharp scanner, Macromind Director, QuickTime and MacRecorder. Available pictures and magazines were used as source materials.

Designers: Kristee Rosendahl, Steve Gano, Nick Robins, Charles Kerns, Kristina Woolsey

Kids, Cameras & Computers

Description

Fifth-grade students constructed video-based observation records for their biology class. Working in small groups, they made video "snapshots" —15 to 20 second sound and video recordings—in which they showed and explained their discoveries. Their videos were recorded directly to the computer and shown instantaneously on the computer screen.

The students performed a number of tasks, such as showing an aorta and cutting a heart in two. For each task, there was a screen that showed videos of experts carrying out the same task (the teacher was one of the experts), as well as published videos of living hearts in motion. A simple, two-click controller was used for making video clips.

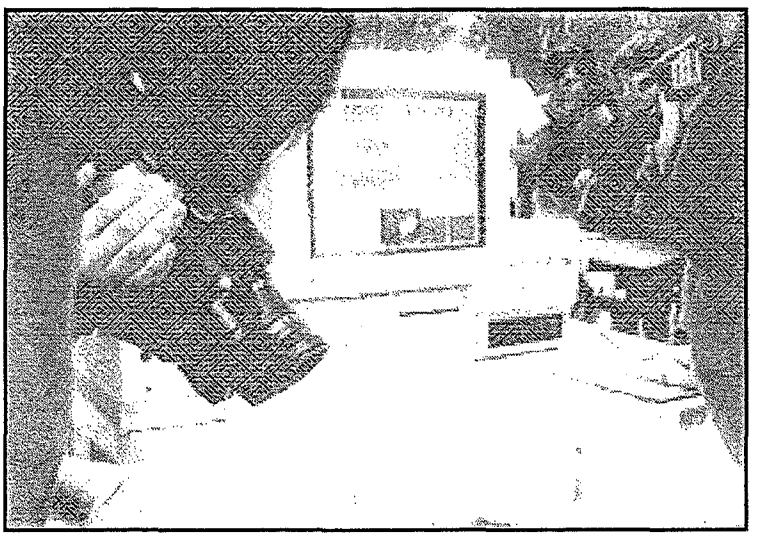
The students were assigned roles that rotated after each shot: explainer, cameraperson, soundperson, computer operator, and helper. The explainer held the heart and spoke during the video recording.

The video lab reports were put on display for public view after the lab. This "video bulletin board" ran between classes and during free periods for students to observe each other's work.

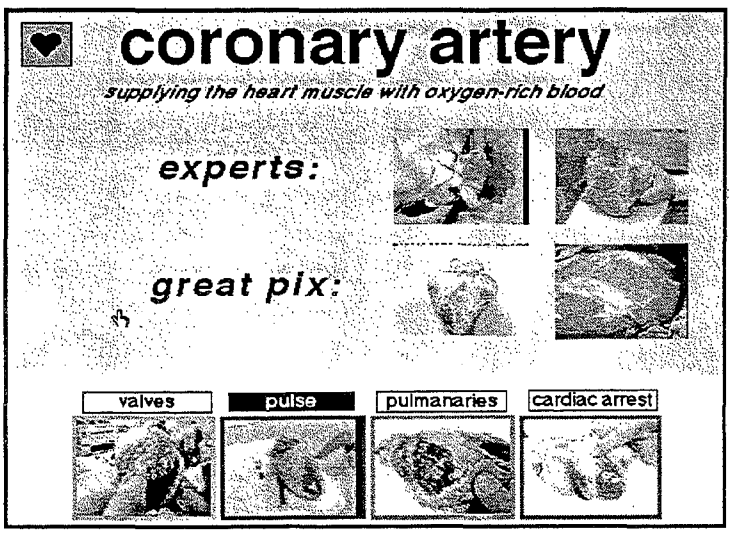
Issues:

• Can the video "snapshot" model (as opposed to traditional narrative moviemaking-) be easily integrated into classroom use by video-naive teachers and students?

• Can students make experiential recordings of their direct interactions with studied phenomena for future sharing and reflection? How can these best be used in learning?



Students make a video snapshot showing the coronary artery. On student holds the heart and explains, while others record video an audio.



The computer screen for the coronary artery. Each picture, when selected, plays a movie. The expert movies in the top row show a doctor and the fifth-grade teacher describing this artery. Great Pix shows a living heart beating. The video snapshots for the four student groups are shown on the bottom. (The group names included Valves, Pulse, Pulmanaries, and Cardiac Arrest.)

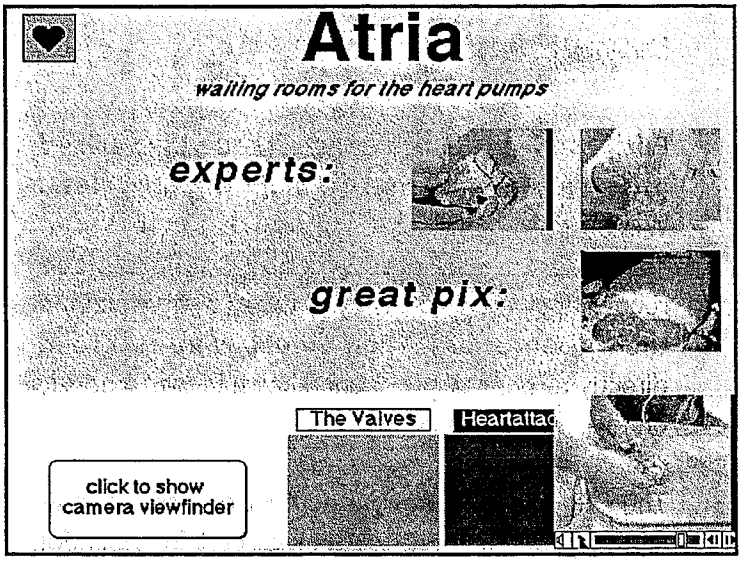
Observations:

• The video snapshot summarizes preceding exploratory activities (e.g., students spend 5 minutes identifying the heart's valves, feeling them, tugging on their support fibers, and then select which activities are to be recorded).

• In the "production" of the video snapshot, students prepare a set of on-screen actions and a narration that explains the task. They identify the important content for each video snapshot collectively, rehearsing and critiquing the narration and actions verbally. A script is not written; the video clip is the only document of their work.

• Recording a video snapshot focuses students' activity on their lab tasks. Each recording is a performance that encourages students attend to the phenomena and the recording. The explainer has to "act;" the cameraperson must frame the object of study. Each student has a job that must be carried out during the recording. Group interdependencies and group peer pressure to complete a successful set of recordings encourage continuous intra-group, on-task collaboration during the lab.

• Student conversations about the heart become very sophisticated during the course of the experiment.



The computer screen for showing the atria. One group has just recorded their video, shown on the bottom right.

Equipment Used:
Macintosh II, VideoSpigot Board, HyperCard, QuickTime Movies, Sony Handycams

Designers :
Charles Kerns and Kristina Woolsey

Graphics :
Joyce McGuire

Materials Available:
Videotape: Kids, Cameras & Computers